

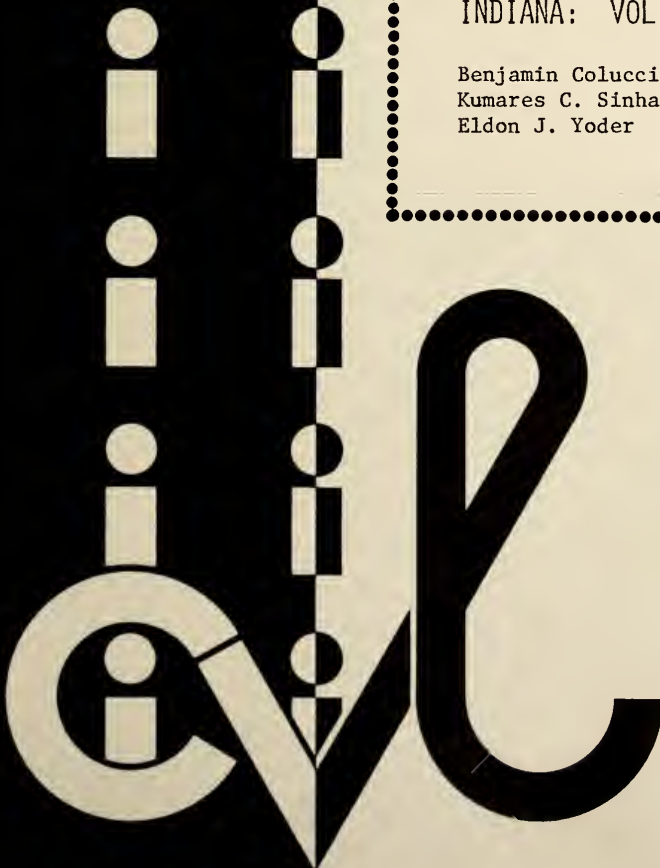
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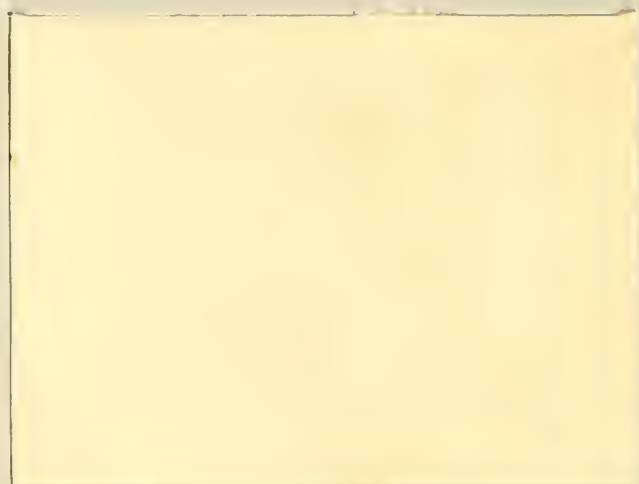
FHWA/IN/JHRP-84/10, Vol. III

DEVELOPMENT OF A METHOD FOR
ESTABLISHING RESURFACING PRIORITIES
FOR THE PAVEMENT MANAGEMENT SYSTEM IN
INDIANA: VOL. III - APPENDICES

Benjamin Colucci-Rios
Kumares C. Sinha
Eldon J. Yoder



PURDUE UNIVERSITY

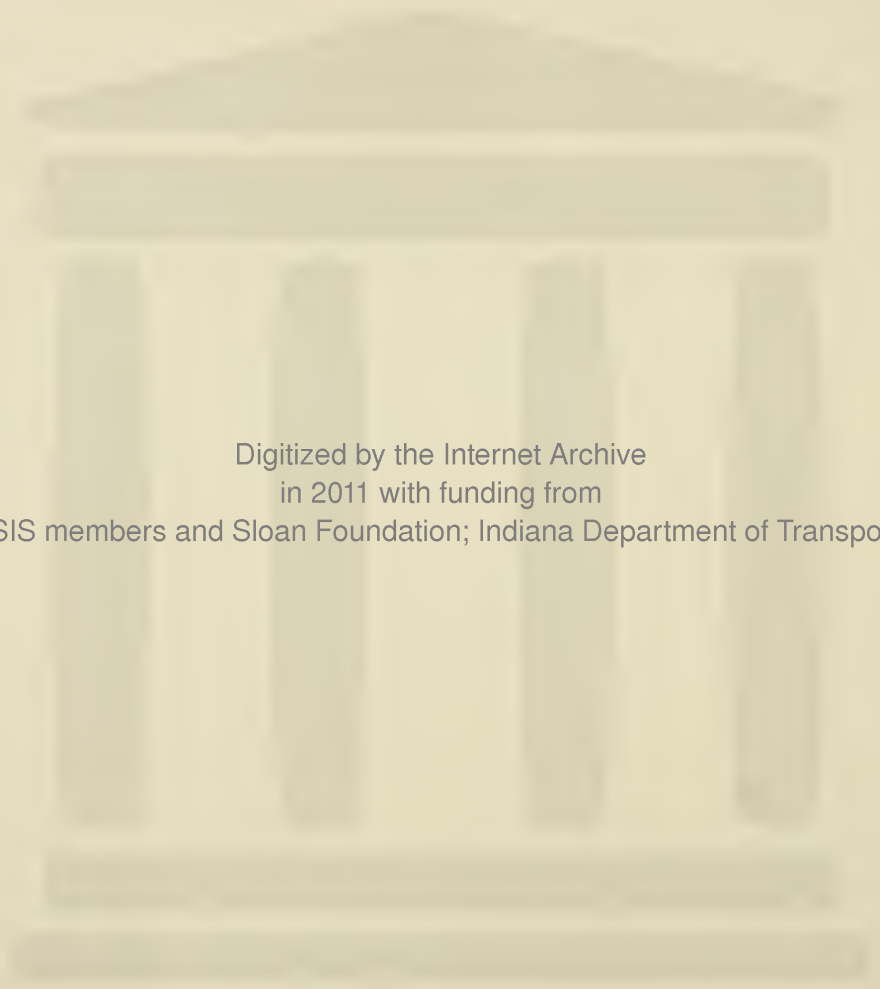


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Final Report

DEVELOPMENT OF A METHOD FOR ESTABLISHING RESURFACING
PRIORITIES FOR THE PAVEMENT MANAGEMENT SYSTEM IN INDIANA:
VOL. III - APPENDICES

by

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Project No.: C-36-63I

File No.: 9-7-9

Prepared as Part of an Investigation

Conducted by

Joint Highway Research Project
Engineering Experiment Station

Purdue University
in cooperation with the

Indiana Department of Highways

and the

U.S. Department of Transportation
Federal Highway Administration

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views of policies of the Federal Highway Administration. This report does not constitute a standard, specification or regulation.

Purdue University
West Lafayette, Indiana

July 3, 1984

Revised May, 1985

Final Report

DEVELOPMENT OF A METHOD FOR ESTABLISHING RESURFACING PRIORITIES FOR THE PAVEMENT MANAGEMENT SYSTEM IN INDIANA

TO: H.L. Michael, Director
Joint Highway Research Project

July 3, 1984
Revised May, 1985

FROM: K.C. Sinha, Research Engineer
Joint Highway Research Project

Project: C-36-63I
File: 9-7-9

Attached is the Final Report on the HPR Part II Study entitled, "Development of a Method for Establishing Maintenance Priorities for the Pavement Management System in Indiana." The research was conducted by Mr. Benjamin Colucci-Rios under the direction of Professors K.C. Sinha and E.J. Yoder.

The report here documents the data used, the procedures followed, the models developed, and model results. Recommendations for incorporating the study findings in the IDOH Pavement Management System are also included. It should be noted that the study findings have already been presented to the members of the IDOH Pavement Management Task Force by Mr. Colucci and Professor Sinha in a workshop held on May 7, 1984.

The report contains three volumes; Vol I provides an executive summary, Vol II presents the study procedures and results, and Vol III includes the appendices.

This report is forwarded for review, comment and acceptance by the IDOH and FHWA as fulfillment of the objectives of the research.

Respectfully submitted,



K.C. Sinha
Research Engineer

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16. Abstract This report presents the appendices of the final report describing the study procedures and results of a research project conducted to develop a methodology for establishing resurfacing priorities for the pavement management system in Indiana.			
17. Key Words Pavement Management, Condition Survey, Performance Function, Resurfacing, Optimization		18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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INTRODUCTION

This report presents the appendices to the report, "Development of a Method for Establishing Resurfacing Priorities for the Pavement Management System in Indiana, Vol. II: Study Procedures and Results." There are five appendices. In Appendix A, are presented the location of test sections used for the computation of Pavement Condition Indices in the Crawfordsville District of the IDOH. Appendix B presents the predicted roughness numbers for the Interstate system. Appendix C lists the equations for the Roughness Reduction Model formulation under Budget Scenario 2. Appendix D presents the complete results of the Contract Section Worth and Roughness Reduction Models under five alternate budget scenarios. In Appendix E is presented the listing of the computer program used to prepare the necessary data for input to the optimization program.

Appendix A
Location of Test Sections in the Crawfordsville District
for Pavement Condition Index Determination

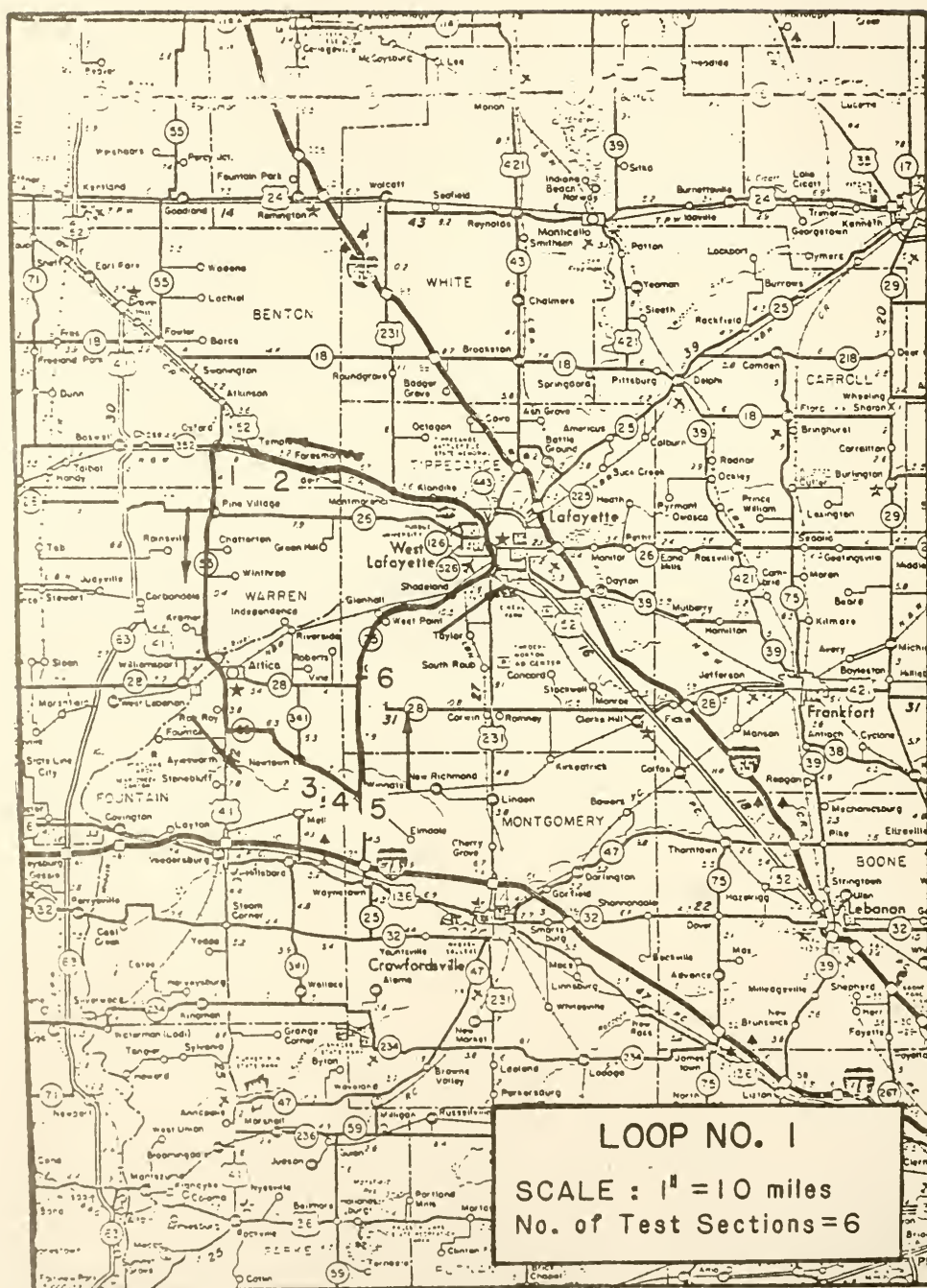


Figure A1. Map of Travel Loop No. 1.

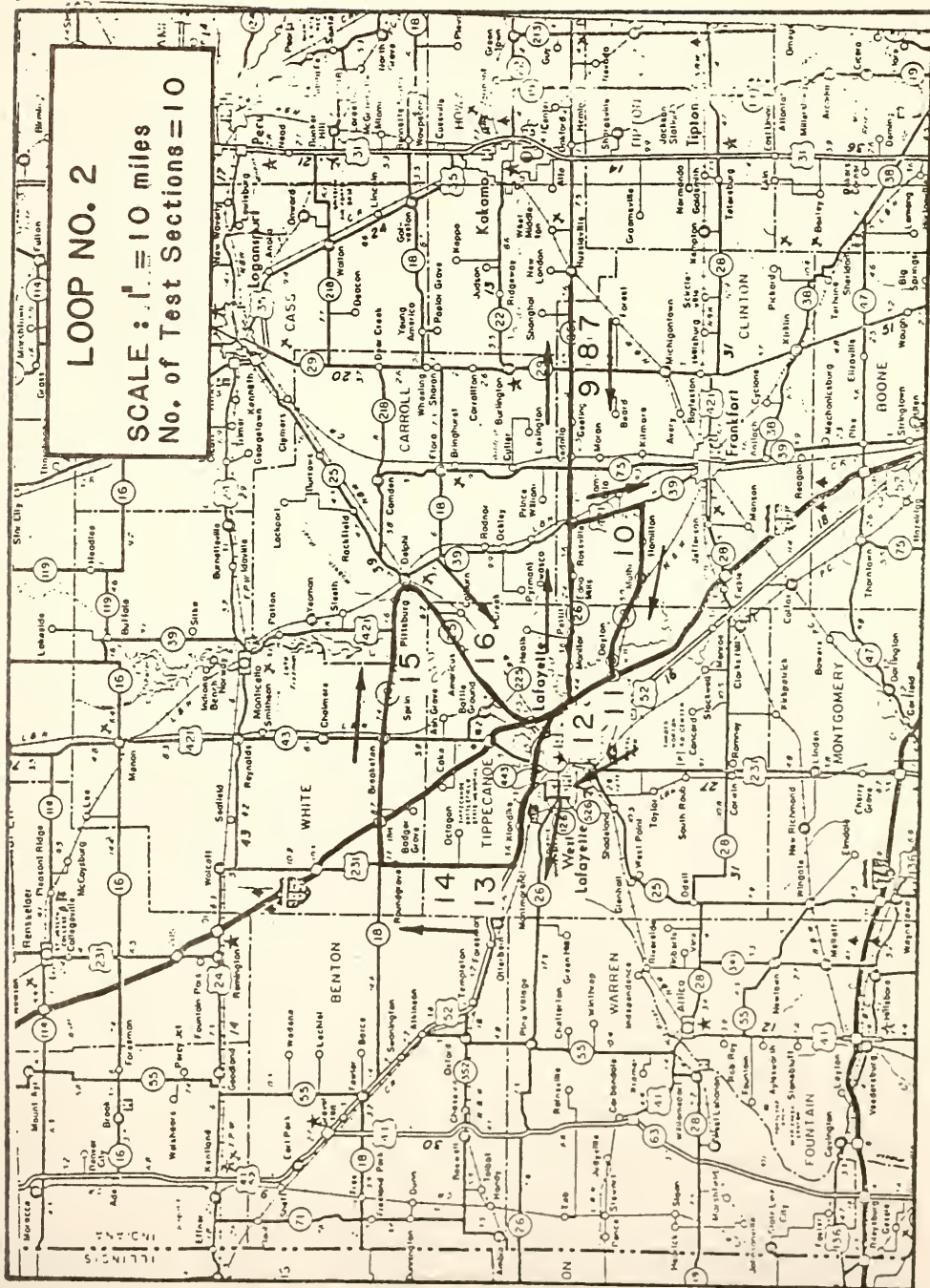


Figure A2 Map of Travel Loop No. 2

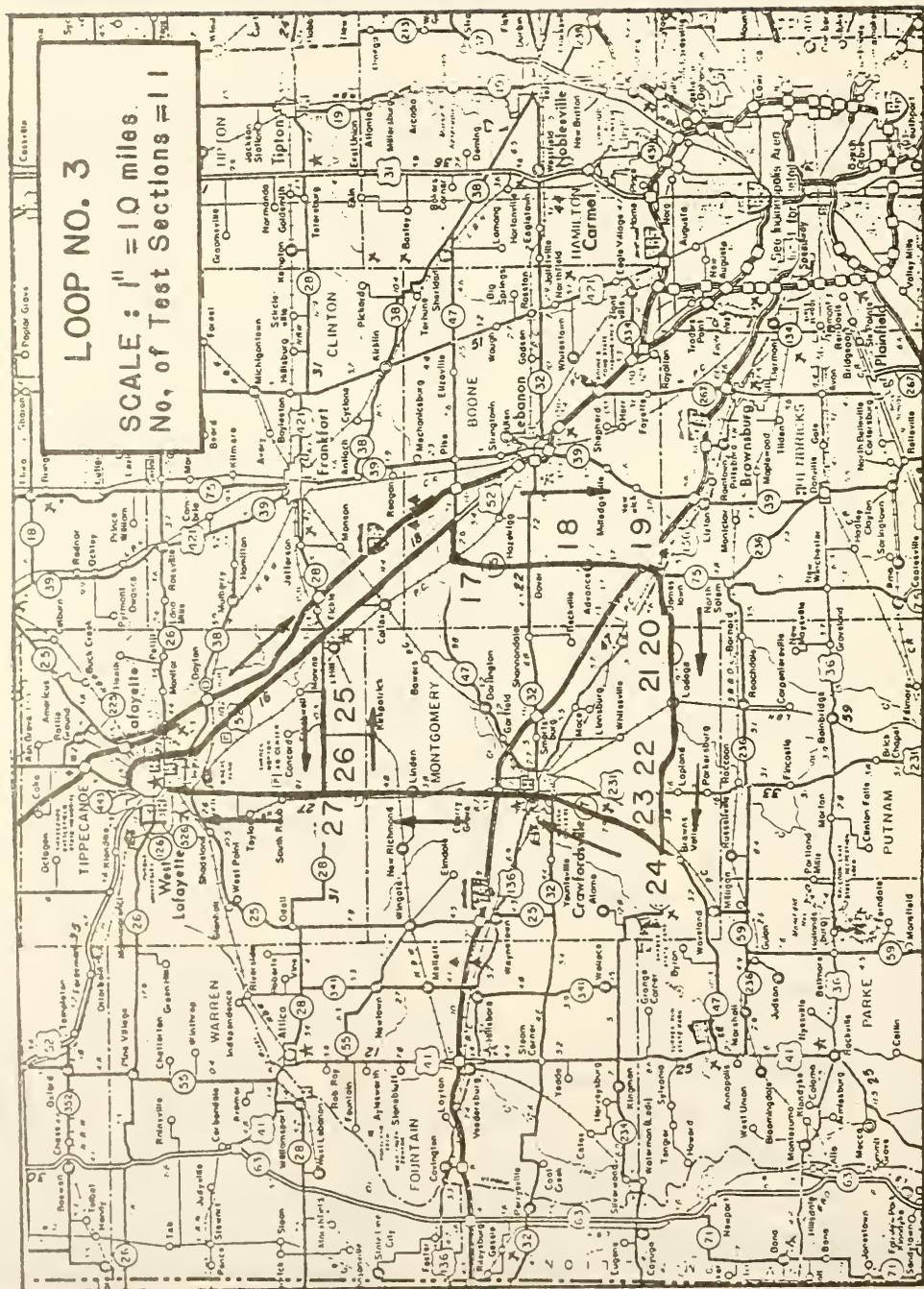


Figure A3 Map of Travel Loop No. 3

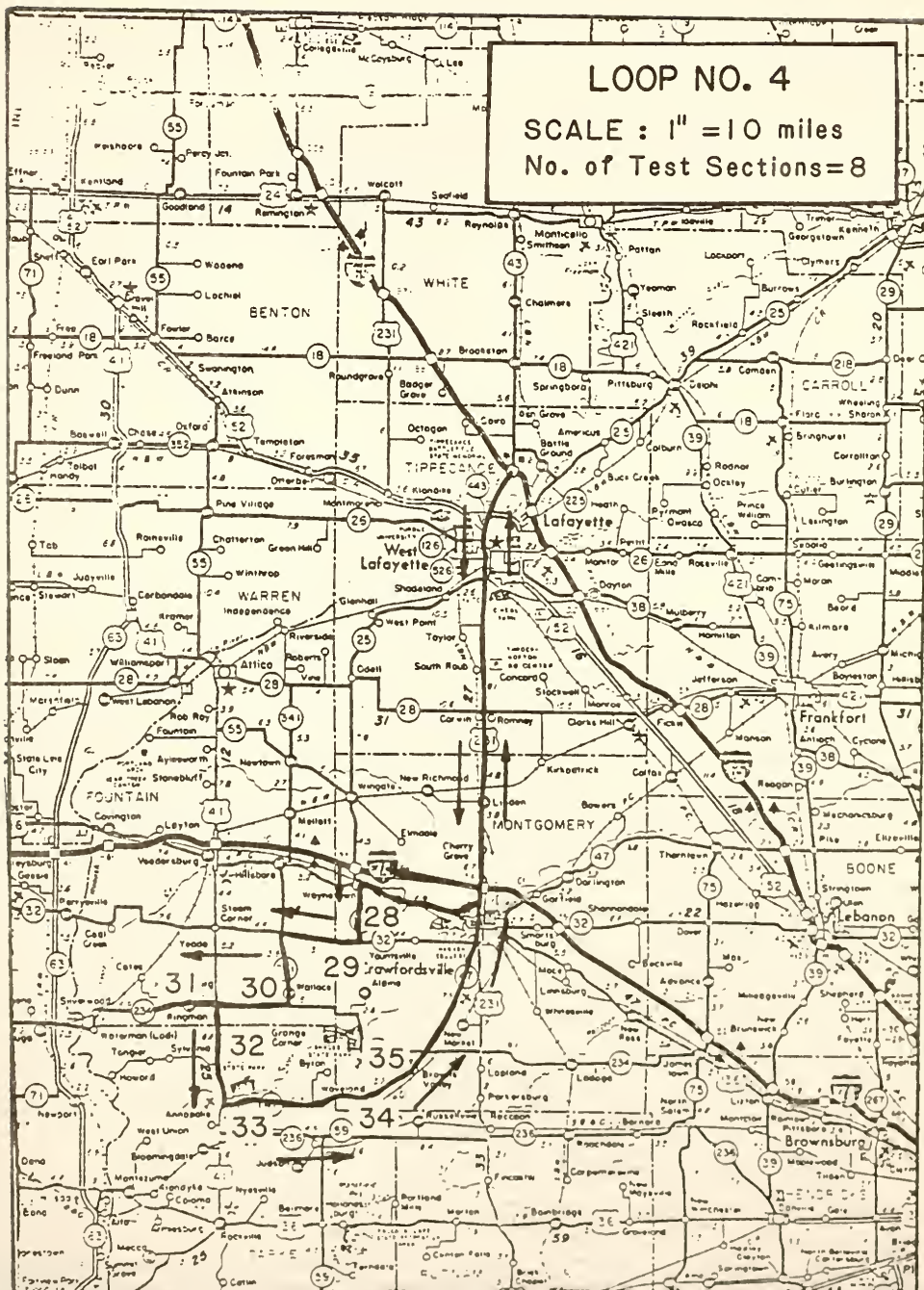


Figure A4 Map of Travel Loop No. 4

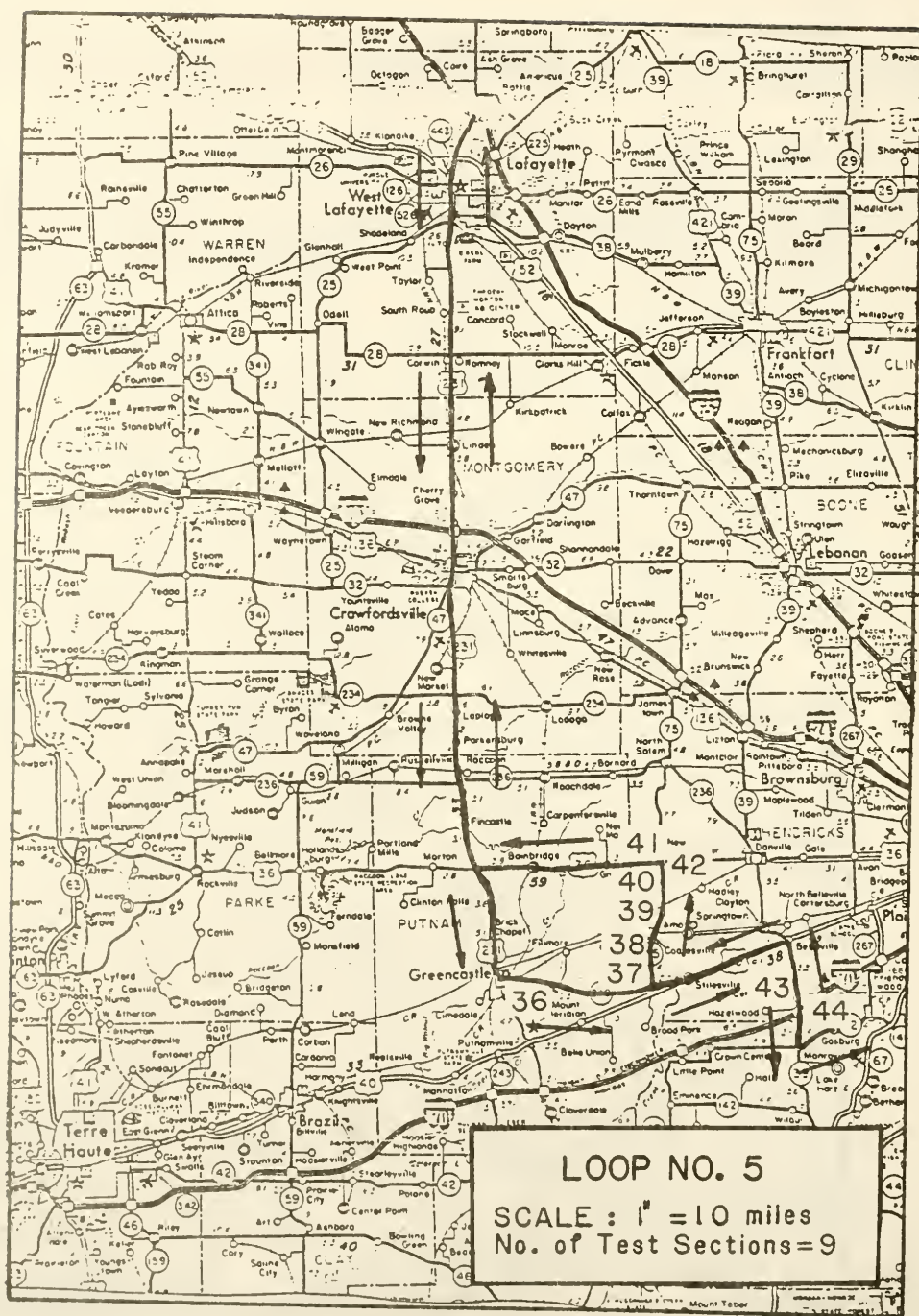


Figure A5 Map of Travel Loop No. 5

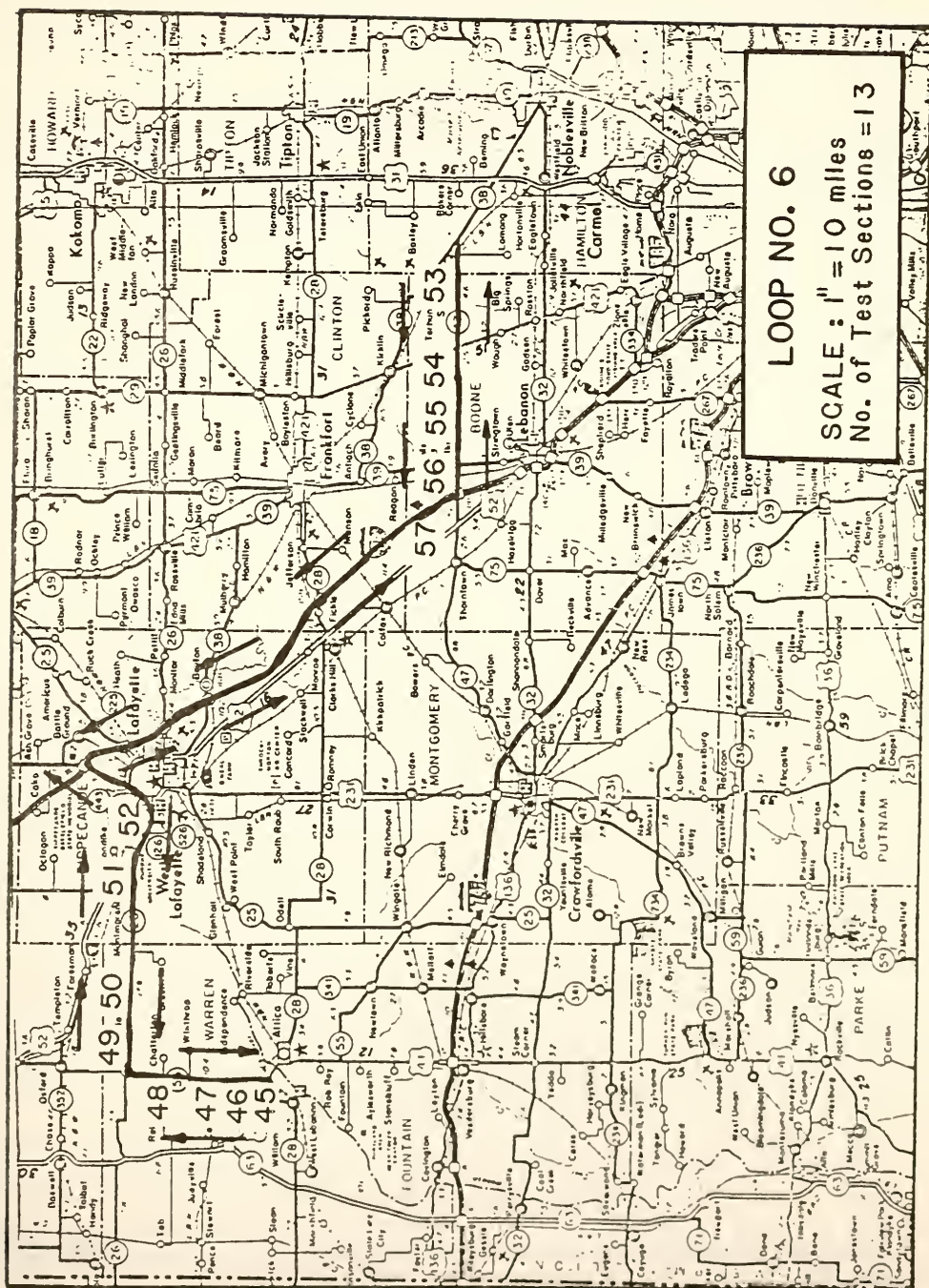


Figure A6 Map of Travel Loop No. 6

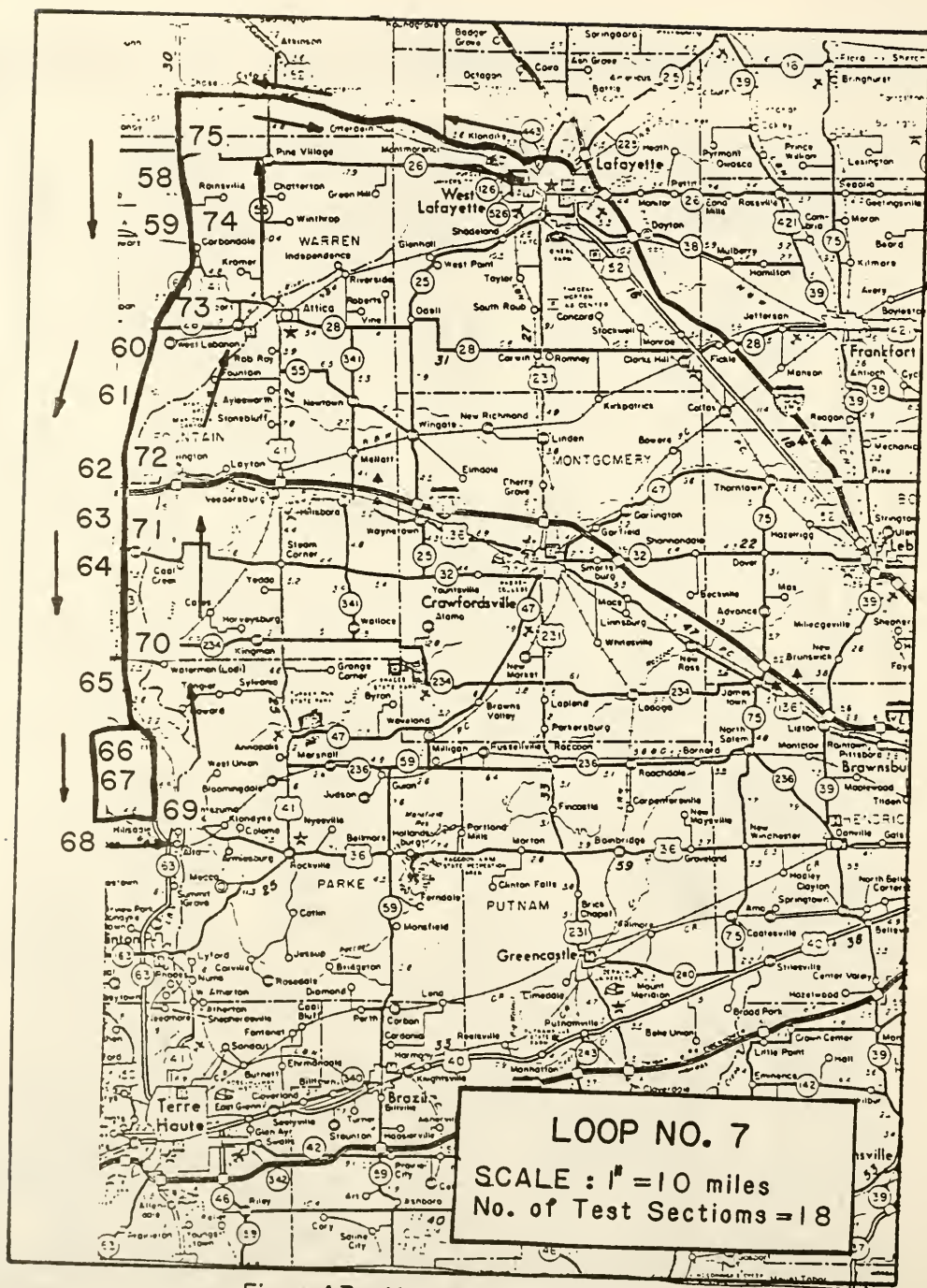


Figure A7 Map of Travel Loop No. 7

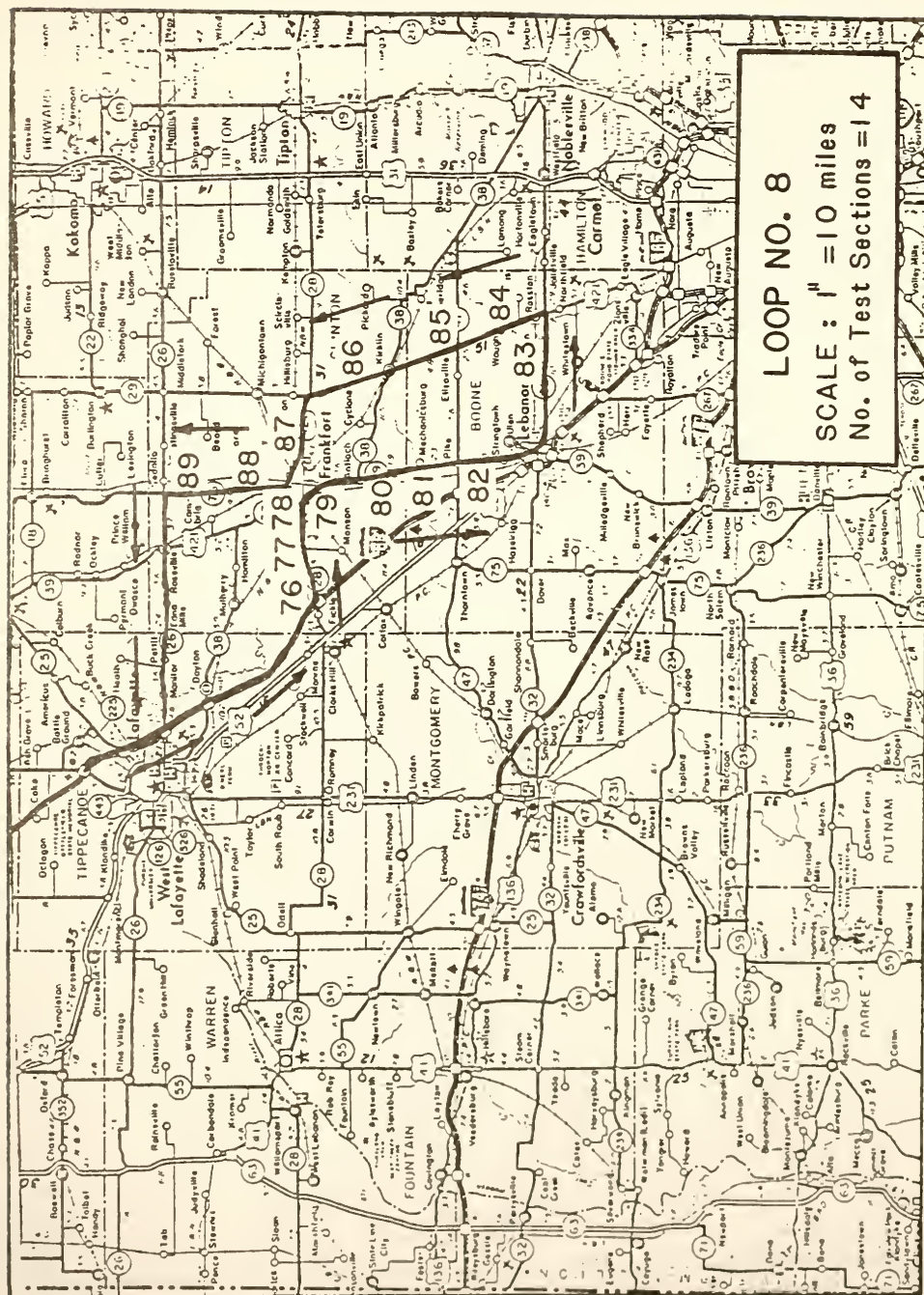


Figure A8 Map of Travel Loop No. 8

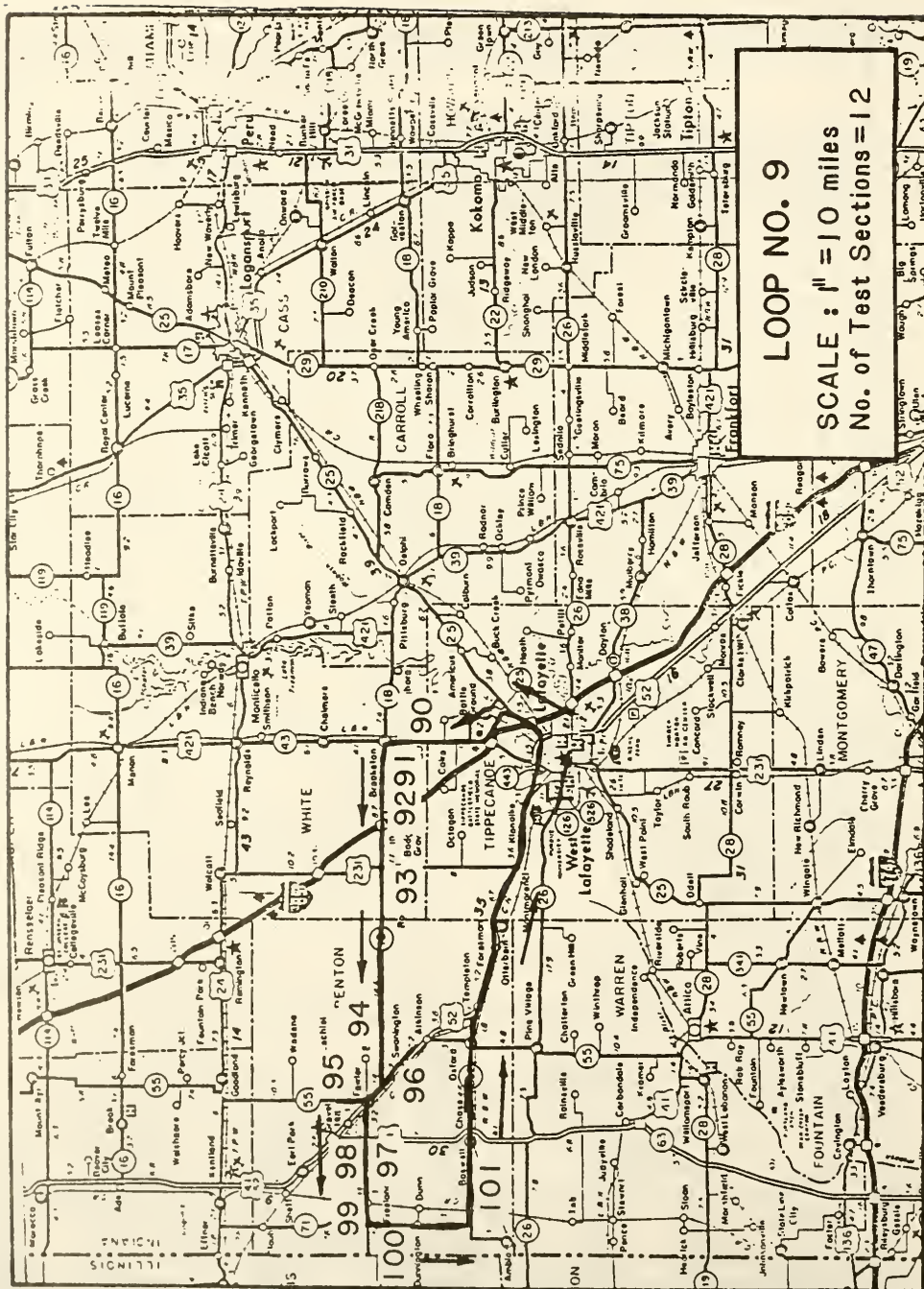


Figure A9 Map of Travel Loop No. 9

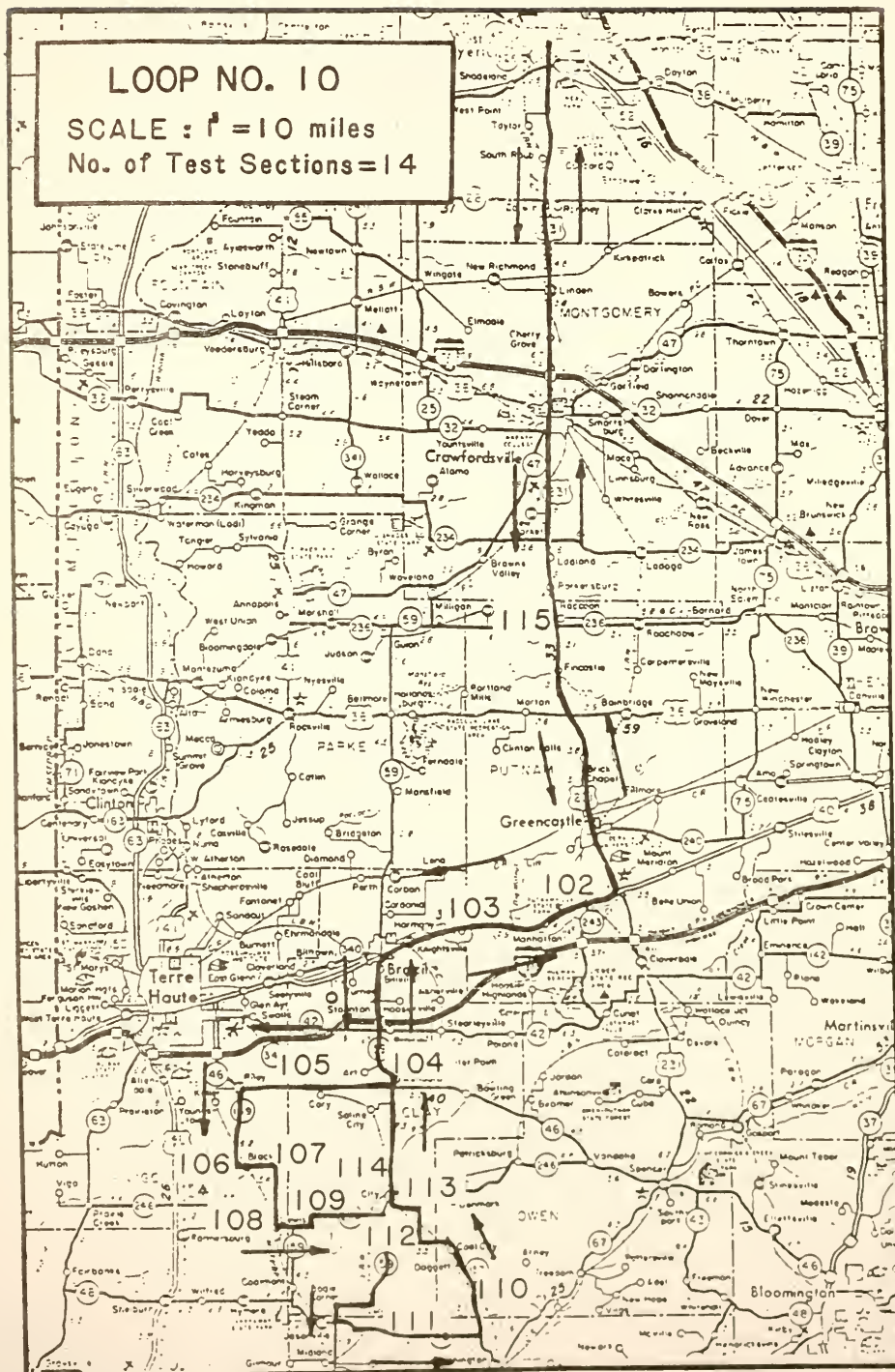


Figure A10 Map of Travel Loop No. 10

Appendix B
Predicted Roughness Numbers for the Interstate System

Table B.1 Predicted Roughness Numbers for Interstate 64 East

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
10391.1	4.4	574	3350.0	7	7484834.0	518	1040	819	477	676.4	827.0	940.7	1026.5	1091.3	
10391.0	1.2	514	3350.0	7	7484834.0	518	1040	819	460	663.6	817.3	933.4	1021.0	1087.2	
10231.0	2.4	514	3679.0	7	8220146.0	437	825	638	436	645.5	803.6	923.0	1013.2	1081.3	
10230.0	5.6	514	3571.0	7	7978610.0	507	857	647	401	619.1	783.7	908.0	1001.8	1072.7	
9967.2	3.3	514	4388.0	8	10997555.0	876	1025	716	563	741.4	876.0	977.7	1054.5	1112.4	
9967.1	2.1	525	4388.0	8	10997555.0	876	1025	716	546	728.5	866.3	970.4	1048.9	1108.3	
9967.0	2.5	574	4040.0	8	10125805.0	545	908	763	614	779.9	905.1	999.7	1071.0	1124.9	
9889.0	9.0	514	3661.0	7	8179099.0	366	742	645	434	644.0	802.5	922.2	1012.6	1080.8	
9617.0	9.1	252	4750.0	8	11904827.0	1095	1424	1023	1133	1259.3	1373.9	1477.8	1572.0	1657.5	
9581.0	9.0	522	4236.0	8	10615986.0	371	810	464	434	644.0	802.5	922.2	1012.6	1080.8	
9364.0	8.6	522	4175.0	9	11555645.0	538	1011	761	570	746.7	880.0	980.7	1056.7	1114.1	
9219.0	4.4	252	6075.0	11	19811232.0	834	1105	955	525	707.9	873.7	1024.1	1160.6	1284.3	
7421.0	4.1	251	4392.0	16	19050294.0	976	1612	1087	627	800.4	957.6	1100.2	1229.6	1346.9	
7388.0	8.2	251	3692.0	16	16016304.0	982	1604	1097	683	851.2	1003.7	1142.0	1267.5	1381.3	
7258.0	5.9	252	13035.0	14	51255476.0	1139	1836	796	1293	1404.4	1505.5	1597.2	1680.3	1755.7	
7115.0	4.7	251	3934.0	14	15467478.0	1276	1776	1255	774	933.7	1078.5	1209.9	1329.1	1437.2	
7058.0	4.5	251	3638.0	17	16475408.0	1159	1842	1276	819	974.5	1115.6	1243.5	1359.5	1464.8	
7056.0	3.7	251	3972.0	17	17986034.0	1371	2070	1440	809	965.4	1107.3	1236.0	1352.8	1458.6	

Table B.2 Predicted Roughness Numbers for Interstate 64 West

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
10391.1	4.4	574	3350.0	7	7484834.0	523	988	576	397	484.4	587.0	707.5	849.0	1015.0
10391.0	1.2	514	3350.0	7	7484834.0	523	988	576	398	485.6	588.4	709.2	850.9	1017.3
10231.0	2.4	514	3679.0	7	8220146.0	531	966	700	549	662.9	796.5	953.5	1137.7	1354.0
10230.0	5.6	514	3571.0	7	7978610.0	464	799	562	453	550.2	664.2	798.1	955.4	1139.9
9967.2	3.3	514	4388.0	8	10997555.0	572	1080	809	453	550.2	664.2	798.1	955.4	1139.9
9967.1	2.1	525	4388.0	8	10997555.0	572	1080	809	561	677.0	813.1	972.9	1160.5	1380.8
9967.0	2.5	574	4040.0	8	10125805.0	604	1009	689	556	671.1	806.2	964.8	1151.0	1369.6
9889.0	9.0	514	3661.0	7	8179099.0	485	963	633	449	545.5	658.7	791.7	947.8	1131.0
9875.0	5.0	262	4714.0	8	11814100.0	909	1369	452	752	848.0	943.4	1038.2	1132.5	1226.2
9617.0	9.1	252	4750.0	8	11904827.0	1083	1502	898	1033	1127.3	1221.0	1314.2	1406.8	1498.9
9581.0	9.0	522	4236.0	8	10615986.0	346	371	370	311	383.5	468.5	568.4	685.6	823.3
9364.0	8.6	522	4175.0	9	11555645.0	466	937	695	528	638.2	767.6	919.5	1097.8	1307.2
9219.0	4.4	252	6075.0	11	19811232.0	1006	1469	927	724	820.2	915.7	1010.7	1105.2	1199.0
7421.0	4.1	251	4392.0	16	19050294.0	895	1458	984	540	637.3	733.9	830.0	925.6	1020.5
7388.0	8.2	251	3692.0	16	16016304.0	1004	1665	1205	757	853.0	948.3	1043.2	1137.4	1231.1
7258.0	5.9	252	13035.0	14	51255476.0	1347	1905	1031	1229	1322.1	1414.7	1506.7	1598.2	1689.1
7115.0	4.7	251	3934.0	14	15467478.0	1050	1804	1234	655	751.6	847.6	943.0	1037.8	1132.1
7058.0	4.5	251	3638.0	17	16475408.0	1534	2210	1695	914	1009.0	1103.5	1197.3	1290.7	1383.4
7056.0	3.7	251	3972.0	17	17986034.0	1466	1941	1367	821	916.6	1011.6	1106.0	1199.9	1293.2

Table B.3 Predicted Roughness Numbers for Interstate 65 North

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11297.0	7.6	114	9350.0	4	12634062.0	438	670	678	355	652.4	864.7	1016.3	1124.5	1201.8
11296.0	14.4	114	10138.0	4	13698779.0	391	490	464	297	610.9	835.1	995.2	1109.4	1191.0
11295.0	10.2	114	8594.0	5	14242293.0	340	589	525	427	703.8	901.4	1042.5	1143.2	1215.1
11240.0	4.5	114	11064.0	5	18335124.0	333	478	361	226	560.3	798.9	969.3	1091.0	1177.8
11239.0	5.2	114	11350.0	5	18809230.0	444	645	441	454	723.0	915.1	1052.3	1150.2	1220.2
11238.0	4.6	114	11350.0	5	18809230.0	550	1082	1061	512	764.5	944.7	1073.4	1165.3	1230.9
11237.0	7.2	114	19297.0	5	31979672.0	648	1022	678	586	817.3	982.4	1100.4	1184.5	1244.7
10932.0	4.5	114	12412.0	6	24220740.0	443	865	713	526	774.5	951.9	1078.5	1168.9	1233.5
10931.0	6.1	114	10467.0	6	20425688.0	832	1233	1898	685	888.0	1032.9	1136.4	1210.3	1263.0
10930.0	5.9	114	9778.0	6	19080694.0	581	534	799	536	781.6	956.9	1082.2	1171.5	1235.4
10734.0	2.3	114	33215.0	5	55043564.0	648	1589	1284	846	1002.9	1115.0	1195.0	1252.1	1292.9
10347.0	1.2	261	27675.0	7	61833668.0	1970	2624	1932	1144	1279.2	1407.3	1528.8	1643.9	1753.1
10235.0	9.7	114	12572.0	6	24532280.0	550	995	530	424	701.6	899.9	1041.4	1142.4	1214.6
10232.0	1.6	261	27267.0	7	60922496.0	1970	2029	1864	1658	1766.4	1869.2	1966.7	2059.1	*2146.6
9876.0	1.5	261	21150.0	7	47254996.0	1710	1853	1986	1110	1246.9	1376.7	1499.8	1616.5	1727.1
8440.0	5.6	253	18793.0	11	61287284.0	1633	1632	1784	1330	1445.7	1527.9	1586.2	1627.6	1657.0
8232.0	4.8	253	9878.0	11	32212002.0	1585	1926	1440	1364	1469.9	1545.0	1598.4	1636.3	1663.2
8221.0	4.4	253	11650.0	12	40699828.0	1485	2103	1492	974	1193.0	1348.4	1458.8	1537.2	1592.8
8208.0	5.7	253	9837.0	12	34366700.0	1528	1661	671	1349	1459.2	1537.5	1593.0	1632.5	1660.5
8159.0	5.6	253	11350.0	12	39652536.0	1153	1843	1271	850	1104.9	1285.9	1414.4	1505.7	1570.4
7935.0	7.8	253	10114.0	12	35334872.0	1795	2041	1844	1421	1510.3	1573.8	1618.8	1650.8	1673.5
7913.0	3.6	253	10860.0	12	37942216.0	1149	2095	1734	1058	1252.6	1390.8	1488.9	1558.5	1608.0
7912.0	5.0	253	13912.0	12	48602128.0	1372	1286	1548	1097	1280.3	1410.4	1502.8	1568.4	1615.0
7858.0	5.3	253	11188.0	11	36485276.0	1428	1535	1609	1080	1268.2	1401.9	1496.7	1564.1	1611.9
7782.0	4.7	253	11298.0	13	41996396.0	1706	1861	1757	1441	1524.5	1583.8	1625.9	1655.8	1677.1

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.3 Predicted Roughness Numbers for Interstate 65 North (Continued)

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
7715.0	3.6	253	11651.0	13	43308460.0	1826	1981	1351	1353	1462.0	1539.5	1594.4	1633.5	1661.2	
7714.0	5.5	253	8139.0	13	30253192.0	1361	1999	1737	1189	1345.6	1456.8	1535.8	1591.8	1631.6	
7677.0	4.4	253	9138.0	13	33968276.0	1639	2532	1794	1171	1332.8	1447.7	1529.3	1587.2	1628.4	
7676.0	4.3	253	8180.0	13	30407402.0	916	1987	1531	799	1068.7	1260.2	1396.2	1492.7	1561.2	
7674.0	4.2	253	11300.0	13	42004144.0	890	1015	947	690	991.3	1205.3	1357.2	1465.0	1541.6	
7634.0	5.4	253	8387.0	15	34712656.0	813	1785	1470	811	1077.2	1266.3	1400.5	1495.7	1563.4	
7633.0	5.2	253	8560.0	13	31819068.0	1927	2972	1792	1544	1597.7	1635.8	1662.8	1682.0	1695.7	
7422.0	6.0	253	8300.0	12	28995612.0	1560	2007	1589	1379	1480.5	1552.6	1603.8	1640.1	1665.9	
7275.0	2.9	252	8100.0	15	33524648.0	2226	3740	950	2237	2315.3	2389.6	2460.0	2526.7	2590.0	
7246.0	3.4	252	8100.0	15	33524648.0	1312	2084	1168	1137	1272.5	1401.0	1522.8	1638.3	1747.7	
7198.0	3.3	252	8100.0	15	33524648.0	1012	2293	1084	1253	1382.5	1505.3	1621.6	1732.0	1836.5	
7144.0	6.0	252	8050.0	15	33317710.0	757	2263	1134	828	979.6	1123.3	1259.5	1388.7	1511.1	
7143.0	6.2	252	8080.0	15	33441208.0	1202	1616	1376	1369	1492.5	1609.5	1720.5	1825.6	1925.4	
7116.0	6.4	252	11230.0	15	46481180.0	864	1884	2395	789	942.6	1088.3	1226.3	1357.2	1481.3	
6600.0	3.5	252	11500.0	17	52080044.0	814	1547	1238	736	892.4	1040.6	1181.2	1314.4	1440.7	
6539.0	4.5	252	11500.0	17	52080044.0	1238	1705	863	1446	1565.5	1678.7	1786.1	1887.8	1984.3	
6414.0	3.3	252	11500.0	17	52080044.0	1208	1659	895	1290	1417.6	1538.5	1653.2	1761.8	1864.9	
6333.0	1.4	252	13561.0	17	61412392.0	1970	1362	2044	958	1102.8	1240.1	1370.3	1493.7	1610.7	
5969.0	2.5	252	19760.0	19	96607456.0	1975	2253	1729	1574	1686.8	1793.7	1895.1	1991.2	2082.3	
5856.0	3.2	252	12686.0	19	62023324.0	2230	2542	2146	1998	2088.8	2174.8	2256.3	2333.7	2407.0	
4710.0	1.4	252	10750.0	22	57829216.0	1531	1532	1746	1516	1631.8	1741.6	1845.7	1944.4	2037.9	

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.4 Predicted Roughness Numbers for Interstate 65 South

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11297.0	7.6	114	9350.0	4	12634062.0	425	773	633	351	649.5	862.6	1014.8	1123.5	1201.0
11296.0	14.3	114	10151.0	4	13716260.0	707	692	412	308	618.8	840.7	999.2	1112.3	1193.1
11295.0	10.1	114	8599.0	5	14249565.0	283	757	541	424	701.6	899.9	1041.4	1142.4	1214.6
11240.0	4.6	114	11063.0	5	18334118.0	223	592	449	424	701.6	899.9	1041.4	1142.4	1214.6
11239.0	5.1	114	11350.0	5	18809230.0	270	427	301	307	618.1	840.2	998.8	1112.0	1192.9
11238.0	4.6	114	11350.0	5	18809230.0	460	1101	1007	602	828.7	990.6	1106.2	1188.7	1247.6
11237.0	7.2	114	19333.0	5	32039218.0	647	1032	813	619	840.9	999.3	1112.4	1193.1	1250.8
10932.0	4.5	114	12412.0	6	24220740.0	584	628	706	593	822.3	986.0	1102.9	1186.4	1246.0
10931.0	6.1	114	10467.0	6	20425688.0	878	992	1209	562	800.2	970.2	1091.6	1178.3	1240.2
10930.0	6.0	114	9900.0	6	19318832.0	490	592	833	639	855.1	1009.5	1119.6	1198.3	1254.5
10347.0	1.2	261	27675.0	7	61833668.0	1814	2050	2011	1675	1807.3	1935.6	2060.0*	2180.7	2297.8
10235.0	9.7	114	12572.0	6	24532280.0	460	695	440	469	733.8	922.8	1057.8	1154.1	1222.9
10232.0	1.6	261	27267.0	7	60922496.0	1814	2017	1743	1376	1517.2	1654.2	1787.1	1916.0	2041.0
10209.0	7.4	114	14860.0	7	33201564.0	386	445	1775	474	737.3	925.3	1059.6	1155.4	1223.9
9876.0	1.5	261	21150.0	7	47254996.0	1657	1857	1816	1138	1286.4	1430.3	1569.9	1705.3	1836.7
9589.0	5.0	113	14128.0	8	35409008.0	1008	1681	1818	1491	1463.5	1443.8	1429.8	1419.7	1412.6
8440.0	5.6	253	18793.0	11	61287284.0	1651	1684	1198	1364	1472.5	1576.6	1676.6	1772.5	1864.7
8295.0	0.4	253	34400.0	12	120180376.0	1814	2050	1718	1490	1593.4	1692.7	1788.0	1879.6	1967.4
8283.0	1.0	252	28490.0	7	63654608.0	1814	2050	2118	1350	1492.0	1629.8	1763.4	1893.0	2018.7
8232.0	4.1	253	9878.0	11	32212002.0	1718	1919	1961	1493	1596.3	1695.5	1790.7	1882.1	1969.8
8221.0	4.4	253	11650.0	12	40699828.0	1602	1973	1659	1298	1409.1	1515.8	1618.2	1716.5	1810.8
8208.0	5.7	253	9837.0	12	34366700.0	1752	2004	1300	1613	1711.5	1806.1	1896.9	1984.0	2067.7
8159.0	5.6	253	11350.0	12	39652536.0	1123	1518	1323	1063	1183.5	1299.2	1410.3	1516.9	1619.2
7935.0	7.8	253	10114.0	12	35334156.0	1795	2149	1405	1662	1758.6	1851.2	1940.2	2025.6	2107.6
7913.0	3.6	253	11262.0	12	39345096.0	1237	1646	2022	1027	1148.9	1266.0	1378.4	1486.3	1589.9

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.4 Predicted Roughness Numbers for Interstate 65 South (Continued)

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
7912.0	5.0	253	13912.0	12	48602128.0	1541	1519	1380	1192	1307.3	1418.1	1524.4	1626.4	1724.4
7858.0	5.3	253	11187.0	11	36482016.0	1358	1479	1692	1088	1207.5	1322.2	1432.4	1538.1	1639.6
7782.0	4.7	253	11297.0	13	41993388.0	1340	1698	1721	1340	1449.4	1554.5	1655.3	1752.2	1845.1
7780.0	1.7	253	33979.0	13	126307624.0	1814	2084	976	1538	1639.5	1737.0	1830.5	1920.3	2006.5
7715.0	3.6	253	11651.0	13	43308460.0	1762	1810	2118	1572	1672.2	1768.3	1860.6	1949.2	2034.3
7714.0	5.5	253	8139.0	13	30253192.0	1731	1911	1111	1693	1788.3	1879.8	1967.6	2052.0*	2132.9
7677.0	4.4	253	9543.0	13	35471372.0	1666	1884	1614	1900	1987.0	2070.6*	2150.8	2227.8	2301.7
7676.0	4.3	253	8180.0	13	30407402.0	966	1166	957	970	1094.2	1213.5	1328.0	1437.9	1543.4
7674.0	4.2	253	11306.0	13	42025264.0	796	1109	727	610	748.6	881.7	1009.5	1132.1	1249.9
7634.0	5.4	253	8378.0	15	34674328.0	792	896	1568	870	998.2	1121.3	1239.5	1353.0	1461.9
7633.0	5.2	253	8560.0	13	31819068.0	1938	2091	1856	1760	1852.6	1941.6	2026.9*	2108.9	2187.6
7624.0	1.7	253	23821.0	13	88545440.0	1814	1612	2074	1666	1762.4	1854.9	1943.8	2029.0*	2110.9
7422.0	6.0	253	8300.0	12	28995612.0	1566	1800	1128	1464	1568.5	1668.8	1765.0	1857.5	1946.2
7275.0	2.9	252	8100.0	15	33524648.0	2089	2612	1098	2097	2216.6	2332.6	2445.1	2554.3	2660.2
7246.0	3.4	252	8100.0	15	33524648.0	1362	1567	1398	1239	1384.3	1525.3	1662.1	1794.7	1923.4
7198.0	3.3	252	8100.0	15	33524648.0	1329	1631	2285	1528	1664.7	1797.2	1925.8	2050.6*	2171.6
7144.0	6.0	252	8050.0	15	33317710.0	809	2503	967	874	1030.3	1181.9	1328.9	1471.6	1609.9
7143.0	6.2	252	8080.0	15	33441208.0	955	1601	938	1086	1235.9	1381.4	1522.4	1659.3	1792.0
7116.0	6.4	252	11230.0	15	46481180.0	810	1246	1171	906	1061.3	1212.0	1358.2	1499.9	1637.4
6600.0	3.5	252	11500.0	17	52080044.0	838	1158	1140	1004	1156.4	1304.2	1447.6	1586.7	1721.6
6539.0	4.5	252	11500.0	17	52080044.0	1264	1451	1857	1411	1551.2	1687.2	1819.1	1947.0	2071.1
6414.0	3.3	252	11500.0	17	52080044.0	936	1360	1184	1325	1467.8	1606.2	1740.6	1870.9	1997.2
6333.0	1.4	252	15843.0	17	71747536.0	1814	1217	2242	1612	1746.2	1876.3	2002.5*	2124.9	2243.7
5969.0	2.5	252	20256.0	19	99032464.0	1833	1991	1731	1825	1952.8	2076.7*	2196.9	2313.5	2426.6
4710.0	1.4	252	10700.0	22	57560248.0	1669	1761	456	1558	1693.8	1825.5	1953.2	2077.1*	2197.3

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.5 Predicted Roughness Numbers for Interstate 69 North

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11664.0	5.7	114	7362.0	5	12200313.0	392	669	890	883	1029.4	1133.8	1208.5	1261.7	1299.8	
11298.0	3.6	114	8153.0	5	13511008.0	401	1660	2451	499	755.2	938.1	1068.7	1161.9	1228.5	
11241.0	9.4	114	7615.0	5	12619902.0	337	899	2812	608	833.0	993.7	1108.4	1190.3	1248.7	
7274.0	5.8	252	12030.0	14	47305440.0	2272	2725	2496	2900	2958.7	3013.6	3065.0	3113.1	3158.1	
7199.0	5.4	252	11450.0	13	42561720.0	1670	2077	1968	1789	1918.8	2040.2	2153.9	2260.3	2359.9	
6930.0	3.6	252	5448.0	17	24670088.0	1871	2430	1941	1757	1888.8	2012.2	2127.7	2235.8	2336.9	
6506.0	4.4	252	6210.0	19	30360674.0	1543	2161	1731	2322	2417.7	2507.2	2591.0	2669.4	2742.8	
6415.0	6.6	252	6100.0	18	28745966.0	1533	2460	2079	2300	2397.1	2487.9	2572.9	2652.5	2727.0	
6183.0	6.1	252	6452.0	18	30406914.0	1812	2408	2312	2560	2640.4	2715.7	2786.1	2852.1	2913.8	
6142.0	6.0	252	9937.0	18	46825476.0	1442	2159	1811	1365	1521.9	1668.8	1806.2	1934.9	2055.3	
6141.0	3.7	252	7259.0	18	34207824.0	1736	2356	778	3125	3169.3	3210.7	3249.5	3285.8	3319.7	
6063.0	5.1	252	8088.0	19	39543184.0	1780	1859	499	1774	1904.7	2027.1	2141.6	2248.8	2349.1	
6062.0	0.5	252	7197.0	19	35187300.0	2545	3070	2662	2533	2615.1	2692.0	2764.0	2831.4	2894.4	
6022.0	3.7	252	7150.0	19	34957348.0	1683	1997	1544	1568	1711.9	1846.6	1972.7	2090.7	2201.1	
5995.0	4.1	252	7102.0	20	35931460.0	1474	2278	1606	1609	1750.3	1882.5	2006.3	2122.2	2230.6	
5968.0	4.0	252	11149.0	19	54508044.0	1776	2113	2084	1858	1983.3	2100.7	2210.5	2313.3	2409.5	
5857.0	5.3	252	7312.0	20	36991636.0	2105	2555	2357	2715	2785.5	2851.5	2913.3	2971.1	3025.2	
5843.0	2.7	252	8842.0	18	41665244.0	1268	2192	2134	2150	2256.7	2356.5	2449.9	2537.4	2619.3	
5842.0	2.2	252	9525.0	20	48187276.0	1665	2177	1953	2010	2125.6	2233.8	2335.1	2429.9	2518.7	
5814.0	3.7	252	9525.0	19	46569060.0	1739	2441	2125	2141	2248.2	2348.6	2442.6	2530.5	2612.8	
5805.0	4.4	252	11499.0	20	58175176.0	1353	1973	2349	1649	1787.7	1917.6	2039.1	2152.9	2259.3	

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.6 Predicted Roughness Numbers for Interstate 69 South

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11298.0	3.6	114	8153.0	5	13511008.0	335	888	2214	547	789.4	962.6	1086.2	1174.4	1237.4	
11241.0	9.1	114	7615.0	5	12619902.0	309	803	1051	585	816.6	981.9	1100.0	1184.3	1244.5	
8128.0	6.6	253	15797.0	13	58718788.0	1102	2053	1304	1348	1458.5	1537.0	1592.7	1632.2	1660.3	
7274.0	5.8	252	11818.0	14	46470528.0	2203	2817	2458	2741	2809.8	2874.3	2934.6	2991.0	3043.9	
7199.0	5.4	252	11450.0	15	47389784.0	1457	1969	1546	1411	1565.0	1709.1	1843.9	1970.2	2088.4	
6930.0	3.6	252	5448.0	17	24670088.0	1682	2017	1763	1579	1722.2	1856.2	1981.7	2099.1*	2209.0	
6506.0	4.4	252	6210.0	19	30360674.0	1614	1926	1690	2046	2159.3	2265.4	2364.7	2457.6	2544.6	
6415.0	6.4	252	6100.0	18	28745966.0	1522	2249	2105	2218	2320.3	2416.1	2505.7	2589.6	2668.1	
6183.0	6.1	252	6452.0	18	30406914.0	1864	2480	1860	2477	2562.7	2643.0	2718.1	2788.4	2854.2	
6142.0	6.0	252	9937.0	18	46825476.0	1323	1804	1902	1429	1581.8	1724.8	1858.7	1984.0	2101.3	
6141.0	3.7	252	7259.0	18	34207824.0	1390	2056	1134	2239	2340.0	2434.5	2522.9	2605.7	2683.2	
6063.0	5.1	252	8088.0	19	39543184.0	1749	1963	777	2056	2168.7	2274.1	2372.9	2465.3	2551.7	
6022.0	3.7	252	7150.0	19	34957348.0	1484	1889	1469	1803	1931.9	2052.5	*2165.4	2271.1	2370.0	
5995.0	4.1	252	7102.0	20	35931460.0	1302	2125	1624	1566	1710.0	1844.9	1971.0	2089.2	*2199.7	
5968.0	4.0	252	11149.0	19	54508044.0	1767	2019	1956	1834	1960.9	2079.6	*2190.8	2294.9	2392.2	
5857.0	5.3	252	7312.0	20	36991636.0	1987	2457	2114	2627	2703.1	2774.4	2841.1	2903.5	2962.0	
5843.0	2.7	252	8842.0	18	41665244.0	1440	2336	2034	1994	2110.6	2219.8	2322.0	2417.7	2507.2	
5842.0	2.2	252	9525.0	19	46569060.0	1916	1858	1728	2121	2229.5	2331.1	2426.2	2515.1	2598.4	
5814.0	4.2	252	9525.0	19	46569060.0	2326	2903	2449	2535	2617.0	2693.8	2765.6	2832.9	2895.9	
5805.0	3.3	252	11499.0	20	58175176.0	1526	2166	1592	1605	1746.5	1879.0	2003.0	2119.1	2227.7	

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.7 Predicted Roughness Numbers for Interstate 70 East

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11958.0	5.7	114	11422.0	4	15461418.0	2074	1617	724	432	707.3	903.9	1044.3	1144.5	1216.1	
10348.0	2.5	261	43488.0	7	97164312.0	1861	2224	1822	1398	1526.9	1663.0	1806.5	1957.9	2117.7	
8743.0	1.1	253	41700.0	10	125904800.0	1861	2224	2203	1150	1317.9	1437.1	1521.8	1581.9	1624.6	
8137.0	1.8	253	37700.0	11	122943760.0	1861	2224	1438	1089	1274.6	1406.4	1500.0	1566.4	1613.6	
7524.0	0.7	252	36350.0	14	14293352.0	1861	2224	1438	1216	1334.9	1460.4	1592.8	1732.5	1879.8	
7473.0	4.5	252	18958.0	14	74544784.0	1979	2229	2022	2537	2728.6*	2930.7	3144.0	3369.0	3606.3	
7390.0	6.6	252	12462.0	13	46323960.0	1768	2289	1870	1965	2125.1*	2294.1	2472.3	2660.3	2858.7	
7389.0	4.8	252	12500.0	13	46464760.0	2604	3383	2577	2208	2381.5	2564.5	2757.7	2961.4	3176.3	
7338.0	6.4	252	12888.0	14	50677516.0	1749	2404	2022	3531	3777.3	4037.1	4311.2	4600.3	4905.4	
7145.0	4.8	252	12000.0	13	44606168.0	1440	1915	1176	767	861.2	960.7	1065.6	1176.2	1293.0	
7118.0	2.4	252	20125.0	14	79134464.0	1744	2395	1354	1138	1252.7	1373.6	1501.2	1635.8	1777.9	
7092.0	5.8	252	12250.0	15	50700860.0	1631	1586	1755	1670	1813.9	1965.7	2125.9*	2294.9	2473.2	
7091.0	0.7	252	12000.0	14	47185768.0	2354	3255	2745	1974	2134.6*	2304.1	2482.9	2671.5	2870.5	
7057.0	2.0	252	12095.0	15	50060328.0	1631	3215	2178	2440	2626.3	2822.8	3030.1	3248.8	3479.5	
6968.0	7.3	252	17140.0	15	70941520.0	1485	1757	1851	1877	2032.3*	2196.1	2369.0	2551.3	2743.7	
6956.0	3.7	252	20500.0	16	88920688.0	1744	2379	1610	1444	1575.5	1714.2	1860.5	2014.9*	2177.8	
6826.0	0.4	252	9523.0	15	39414920.0	2094	2818	2321	1115	1228.4	1348.0	1474.2	1607.3	1747.8	
6815.0	6.9	252	9610.0	16	41685232.0	2338	2707	1986	3621	3872.2	4137.2	4416.9	4711.8	5023.1	
6685.0	5.3	252	11707.0	15	48455420.0	2028	1983	2499	2571	2764.5	2968.6	3183.9	3411.1	3650.7	
6603.0	6.4	252	9310.0	15	38530760.0	2023	2583	2380	2917	3129.5	3353.7	3590.2	3839.7	4103.0	
6602.0	9.2	252	9412.0	15	38954816.0	2030	2579	1920	3138	3362.6	3599.7	3849.7	4113.5	4391.8	

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.8. Predicted Roughness Numbers for Interstate 70 West

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11958.1	5.7	114	11442.0	4	15461418.0	1832	1617	536	469	733.8	922.8	1057.8	1154.1	1222.9	
11958.0	5.7	114	11442.0	4	15461418.0	1832	810	536	469	733.8	922.8	1057.8	1154.1	1222.9	
10348.0	2.5	261	43344.0	7	96842584.0	1765	2257	2080	2227	2320.3	2410.0	2496.0	2578.6	2657.9	
8743.0	1.3	253	41085.0	10	124046776.0	1765	2257	1386	1373	1476.3	1549.6	1601.6	1638.6	1664.8	
8137.0	1.7	253	37700.0	11	122943760.0	1765	2257	1386	1187	1344.2	1455.8	1535.0	1591.3	1631.2	
7524.0	0.6	252	36350.0	14	142933552.0	1765	2290	1815	967	1110.8	1248.8	1381.2	1508.4	1630.5	
7473.0	4.5	252	18958.0	14	74544784.0	1691	2596	1815	2087	2185.9	2280.9	2372.1	2459.7	2543.7	
7390.0	6.6	252	12462.0	13	46323960.0	1554	2270	1744	1631	1748.2	1860.7	1968.7	2072.4	2171.9	
7389.0	4.8	252	12500.0	13	46464760.0	1959	2385	2172	1667	1782.8	1893.9	2000.5	2103.0	2201.3	
7338.0	6.4	252	12888.0	15	53341448.0	1642	2776	2207	3082	3141.1	3197.9	3252.4	3304.8	3355.0	
7145.0	4.8	252	12000.0	14	47185768.0	1568	1970	1343	966	1109.8	1247.8	1380.3	1507.6	1629.7	
7118.0	2.4	252	20125.0	14	79134464.0	1840	1546	1180	945	1089.6	1228.5	1361.8	1489.7	1612.6	
7092.0	5.8	252	12250.0	15	50700860.0	1468	1585	1350	1351	1479.4	1602.6	1721.0	1834.6	1943.6	
7091.0	0.7	252	12000.0	14	47185768.0	2415	2928	2671	1575	1694.4	1809.1	1919.1	2024.8	2126.3	
7057.0	2.0	252	12095.0	15	50060328.0	1468	3688	2505	2323	2412.5	2498.4	2580.9	2660.1	2736.1	
6968.0	7.3	252	17140.0	15	70941520.0	1421	2358	1584	1626	1743.4	1856.1	1964.3	2068.1	2167.8	
6956.0	3.7	252	20500.0	16	88920688.0	1840	2183	2273	1630	1747.2	1859.8	1967.8	2071.5	2171.1	
6826.0	0.4	252	9523.0	15	39414920.0	2035	2774	2574	2599	2677.5	2752.8	2825.1	2894.5	2961.2	
6815.0	6.9	252	9610.0	16	41685232.0	2382	3120	2514	3506	3548.2	3588.7	3627.6	3664.9	3700.7	
6685.0	5.3	252	11707.0	15	48453420.0	1879	2535	1758	2279	2370.3	2457.9	2542.0	2622.8	2700.3	
6603.0	6.4	252	9310.0	16	40381024.0	1844	2602	2317	2710	2784.0	2855.1	2923.3	2988.8	3051.7	
6602.0	9.2	252	9412.0	15	38954816.0	1992	2761	2466	2628	2705.3	2779.5	2850.8	2919.2	2984.8	

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.9 Predicted Roughness Numbers for Interstate 74 East

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11855.0	15.9	114	5564.0	4	7518547.0	1210	378	315	315	623.8	844.3	1001.7	1114.1	1194.4
6817.0	1.9	252	3925.0	15	16244971.0	1210	1700	1769	1137	1294.3	1446.7	1594.4	1737.6	1876.2
6491.0	6.2	252	4175.0	18	19674492.0	1325	1540	1561	1366	1516.2	1661.8	1802.8	1939.5	2071.9
6417.0	6.1	252	4124.0	19	20163696.0	1493	1517	1412	1014	1175.1	1331.2	1482.5	1629.1	1771.2
6362.0	5.5	252	3433.0	17	15547025.0	1305	1634	1705	1215	1369.9	1520.0	1665.4	1806.3	1942.9
6290.0	6.3	252	3763.0	18	17732962.0	1558	1818	1794	1515	1660.6	1801.7	1938.4	2070.8	2199.2
6269.0	5.3	252	3855.0	15	15954001.0	2081	2359	2163	1712	1851.5	1986.6	2117.6	2244.5	2367.5
6268.0	4.0	252	3925.0	15	16244971.0	1210	1458	1274	898	1062.7	1222.3	1377.0	1526.8	1672.1
6064.0	6.0	252	5212.0	19	25483570.0	1661	2057	1860	1459	1606.3	1749.1	1887.4	2021.4	2151.3
5481.0	5.8	252	6450.0	20	32630752.0	1798	2091	1936	1739	1877.6	2012.0	2142.2	2268.3	2390.5
5469.0	6.6	252	5087.0	20	25735292.0	2621	2843	2373	2407	2524.9	2639.2	2749.9	2857.2	2961.2
5468.0	2.9	252	5077.0	20	25686558.0	2360	2683	2387	2182	2306.9	2427.9	2545.2	2658.9	2769.0
5434.0	5.4	252	6008.0	20	30397144.0	1798	1998	1986	1919	2052.1	2181.0	2305.9	2427.0	2544.3
5197.0	8.0	252	5820.0	21	30394300.0	1316	1526	1599	1173	1329.2	1480.5	1627.2	1769.3	1907.0
4843.0	3.5	252	8000.0	22	43035696.0	1989	2456	1777	1934	2066.6	2195.1	2319.6	2440.2	2557.1
4651.0	4.9	252	7821.0	21	40846536.0	1138	1649	1571	1139	1296.2	1448.6	1596.3	1739.3	1877.9
4614.0	7.5	252	5907.0	22	31777754.0	1881	2073	1912	1681	1821.4	1957.5	2089.4	2217.2	2341.0
4545.0	6.6	252	10501.0	22	56490464.0	2137	2180	2134	2165	2290.4	2412.0	2529.8	2643.9	2754.5
4507.0	5.8	252	8320.0	23	46014172.0	1883	2123	1922	1746	1884.4	2018.6	2148.5	2274.5	2396.5
4399.0	7.3	252	7597.0	22	40869616.0	1410	1618	1474	1421	1569.5	1713.4	1852.8	1987.9	2118.9

* Indicates roughness number and year the pavement section was selected as input to the model.

Table B.10 Predicted Roughness Numbers for Interstate 74 West

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11855.0	15.9	114	5387.0	4	7278745.0	1395	334	353	248	576.0	810.1	977.3	1096.7	1181.9	
6817.0	1.9	252	3925.0	15	16244971.0	1395	1357	1638	1041	1136.6	1223.4	1302.2	1373.8	1438.8	
6491.0	6.3	252	4175.0	18	19674492.0	1353	1540	1455	994	1093.9	1184.7	1267.0	1341.8	1409.8	
6417.0	6.1	252	4124.0	19	20163696.0	1237	1599	1351	804	921.4	1028.0	1124.8	1212.7	1292.5	
6362.0	5.5	252	3433.0	17	15547025.0	1297	1810	1534	972	1073.9	1166.5	1250.6	1326.9	1396.2	
6290.0	6.3	252	3763.0	18	17732962.0	1208	1502	1259	899	1007.7	1106.3	1195.9	1277.3	1351.1	
6269.0	5.3	252	3855.0	15	15954001.0	2048	1994	1982	1528	1578.8	1624.9	1666.8	1704.8	1739.3	
6268.0	4.0	252	3925.0	15	16244971.0	1395	1528	1537	976	1077.6	1169.8	1253.6	1329.6	1398.6	
6064.0	6.2	252	5212.0	19	25483570.0	1361	1486	1531	1248	1324.6	1394.1	1457.2	1514.5	1566.5	
5481.0	5.8	252	6450.0	20	32630752.0	1917	2313	2219	1593	1637.8	1678.5	1715.5	1749.0	1779.5	
5469.0	6.6	252	5087.0	20	25735292.0	2381	2663	2009	1861	1881.2	1899.5	1916.1	1931.2	1944.9	
5468.0	2.9	252	5077.0	20	25686558.0	2394	2664	2080	1837	1859.4	1879.7	1898.1	1914.9	1930.1	
5434.0	5.4	252	6008.0	22	32322452.0	1923	2213	1929	1448	1506.2	1559.0	1606.9	1650.4	1690.0	
5197.0	8.0	252	5820.0	21	30394300.0	1301	1627	1552	1065	1158.4	1243.2	1320.2	1390.1	1453.6	
4843.0	4.8	252	8000.0	22	43035696.0	1956	2080	1848	1554	1602.4	1646.4	1686.3	1722.5	1755.4	
4651.0	4.9	252	7821.0	21	40846536.0	1272	1537	1584	1188	1270.1	1344.6	1412.3	1473.7	1529.5	
4614.0	7.5	252	5907.0	22	31777754.0	1782	1944	1772	1435	1494.3	1548.2	1597.2	1641.6	1681.9	
4399.0	7.3	252	7597.0	22	40869616.0	1546	1764	1613	1339	1407.2	1469.1	1525.3	1576.3	1622.7	

Table B.11 Predicted Roughness Numbers for Interstate 94 East

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11963.0	8.7	142	49038.0	4	66261844.0	965	550	557	388	675.9	881.5	1028.3	1133.1	1207.9	
10842.0	6.7	142	58586.0	6	114324192.0	722	1080	1086	968	1090.0	1177.2	1239.4	1283.8	1315.5	
8553.0	4.5	252	17200.0	12	60090188.0	1098	1350	1358	943	1088.6	1226.7	1357.5	1481.6	1599.2	
8476.0	3.3	252	19081.0	13	70928464.0	1098	1100	1152	830	981.5	1125.1	1261.2	1390.3	1512.7	
7933.0	3.5	252	18510.0	13	68805016.0	1135	1700	1835	1472	1590.1	1702.1	1808.2	1908.8	2004.2	
7883.0	4.9	252	19350.0	14	76087056.0	1018	950	1038	729	885.7	1034.3	1175.2	1308.7	1435.3	
7857.0	4.2	252	20219.0	14	79504272.0	1288	1500	1690	1345	1469.7	1587.9	1700.0	1806.3	1907.0	
7525.0	3.9	252	29044.0	14	114205744.0	1208	1100	1243	922	1068.7	1207.8	1339.6	1464.6	1583.1	

Table B.12 Predicted Roughness Numbers for Interstate 94 West

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11963.0	8.7	142	49038.0	4	66261844.0	511	588	646	333	636.7	853.5	1008.3	1118.8	1197.7
10842.0	6.7	142	58504.0	6	114164008.0	623	752	819	511	763.7	944.2	1073.1	1165.0	1230.7
8553.0	4.5	252	17200.0	12	60090188.0	957	1146	1283	780	934.1	1080.2	1218.6	1349.9	1474.4
8476.0	3.6	252	19081.0	13	70928464.0	922	993	1080	573	737.9	894.1	1042.3	1182.7	1315.9
7933.0	3.5	252	18510.0	13	68805016.0	704	875	1944	1392	1514.3	1630.2	1740.1	1844.2	1943.0
7883.0	4.9	252	19350.0	14	76087056.0	887	1056	1200	647	808.0	960.6	1105.3	1242.5	1372.5
7857.0	4.2	252	20219.0	14	79504272.0	873	1167	1372	1145	1280.1	1408.2	1529.6	1644.7	1753.9
7525.0	4.0	252	29044.0	14	114205744.0	974	1158	1252	779	933.1	1079.3	1217.8	1349.1	1473.6

Table B.13 Predicted Roughness Numbers for Interstate 465 I⁺

Contract	Length	Surface	ADT	Age	Total ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
10237.0	1.3	114	25850.0	8	64787328.0	700	801	903	836	995.8	1109.9	1191.3	1249.5	1291.0
7841.0	6.0	253	27000.0	13	100363888.0	1181	1262	1336	1084	1271.1	1403.9	1498.2	1565.1	1612.7
7529.0	5.8	252	15800.0	13	58731460.0	1181	1098	1002	898	1046.0	1186.2	1319.2	1445.2	1564.7
7391.0	4.2	252	22069.0	14	86778744.0	1181	1165	1151	1098	1235.6	1366.0	1489.6	1606.8	1717.9
7276.0	4.2	252	19314.0	15	79938848.0	1181	1305	1458	1123	1259.3	1388.4	1510.9	1627.0	1737.0
6957.0	3.1	252	31952.0	15	132242600.0	1344	1645	1987	1364	1487.7	1605.0	1716.2	1821.6	1921.5
6910.0	2.4	252	35042.0	15	145033440.0	1685	1585	1496	1499	1615.7	1726.3	1831.2	1930.6	2024.9
6877.0	2.3	252	23615.0	15	97739736.0	1280	1314	1355	1029	1170.1	1303.9	1430.8	1551.0	1665.0
5969.0	1.3	252	23331.0	19	114067400.0	1522	1734	1915	1573	1685.9	1792.8	1894.3	1990.4	2081.6
5806.0	3.7	252	25938.0	20	131220328.0	951	1346	1652	1288	1415.7	1536.7	1651.5	1760.2	1863.3
5687.0	2.0	252	23775.0	20	120278464.0	951	878	817	741	897.1	1045.1	1185.4	1318.4	1444.5
5483.0	2.6	252	24094.0	20	121893472.0	1629	1737	1862	1366	1489.6	1606.8	1717.9	1823.2	1923.1
5296.0	2.9	252	28948.0	21	151179120.0	1460	1397	1364	1364	1487.7	1605.0	1716.2	1821.6	1921.5
5199.0	2.8	252	22607.0	21	118063280.0	974	1143	1221	1090	1228.0	1358.8	1482.8	1600.3	1711.7
5046.0	2.5	252	36458.0	21	190397824.0	1830	1943	2188	1624	1734.2	1838.7	1937.7	2031.6	2120.6
4845.0	0.8	252	35500.0	22	190970912.0	951	1447	1827	1005	1147.4	1282.4	1410.3	1531.7	1646.7
4710.0	3.2	252	23889.0	22	128512104.0	1786	1643	1551	1615	1725.7	1830.6	1930.0	2024.3	2113.7
4709.0	1.2	252	38117.0	22	205047184.0	1830	1685	1515	1392	1514.3	1630.2	1740.1	1844.2	1943.0

* Indicates roughness number and year the pavement section was selected as input to the model.

+ Means inner lane.

Table B.14 Predicted Roughness Numbers for Interstate 465 0 +

Contract	Length	Surface	ADT	Age	Total	ADT	RN79	RN80	RN81	RN82	RN83	RN84	RN85	RN86	RN87
11197.0	1.6	114	24578.0	5	40730888.0	0	515	557	600	1296	1324.2	1344.4	1358.8	1369.1	1376.4
7841.0	6.0	253	27015.0	13	100419640.0	0	1131	1164	1197	1151	1318.6	1437.6	1522.1	1582.1	1624.7
7529.0	5.6	252	15800.0	13	58731460.0	0	1131	1046	943	1173	1306.7	1433.4	1553.5	1667.3	1775.3
7391.0	4.2	252	22005.0	14	86525976.0	0	1131	1355	1548	1284	1411.9	1533.1	1648.0	1757.0	1860.3
7276.0	4.2	252	19314.0	15	79938848.0	0	1131	1442	1553	1305	1431.8	1552.0	1665.9	1774.0	1876.4
6957.0	3.2	252	31952.0	15	132242600.0	0	1143	1345	1672	1254	1383.4	1506.2	1622.5	1732.8	1837.3
6910.0	2.5	252	35042.0	15	145033440.0	0	1518	1510	1502	1387	1509.5	1625.7	1735.8	1840.2	1939.1
6877.0	1.7	252	24306.0	15	100598312.0	0	1402	1405	1403	808	960.6	1105.3	1242.5	1372.5	1495.8
5969.0	1.3	252	23331.0	19	114067400.0	0	1723	1578	2074	1729	1833.7	1933.0	2027.2	*2116.4	2201.0
5806.0	3.7	252	25938.0	20	131220328.0	0	1011	1468	1747	1215	1346.5	1471.1	1589.3	1701.3	1807.4
5687.0	2.0	252	23775.0	20	120278464.0	0	1011	876	812	916	1063.0	1202.4	1334.5	1459.8	1578.5
5483.0	2.9	252	24110.0	20	121974992.0	0	1816	1893	1964	1844	1942.8	2036.4	*2125.1	2209.3	2289.1
5296.0	2.9	252	28997.0	21	151431248.0	0	1404	1472	1535	1460	1578.7	1691.3	1798.0	1899.1	1995.0
5199.0	2.8	252	22607.0	21	118063280.0	0	966	803	653	1160	1294.3	1421.7	1542.4	1656.8	1765.3
5046.0	2.5	252	36526.0	21	190752960.0	0	1814	2035	2290	1728	1832.8	1932.1	*2026.3	*2115.6	2200.2
4845.0	0.8	252	35500.0	22	190970912.0	0	917	1018	1131	873	1022.3	1163.7	1297.9	1425.0	1545.6
4710.0	3.4	252	21900.0	22	117810224.0	0	1510	1654	1802	1731	1835.6	1934.8	2028.9	*2118.0	2202.5
4709.0	1.2	252	38117.0	22	205047184.0	0	1814	1537	940	1829	1928.5	2022.9	*2112.4	2197.2	2277.6

* Indicates roughness number and year the pavement section was selected as input to the model.

+ Means outer lane.

Appendix C
Roughness Reduction Model Formulation for Budget Scenario 2

MAXIMIZE

2202.52 x1c1 + 2333.82 x1d1 + 2447.14 x1e1 +
 2723.93 x1c2 + 2886.32 x1d2 + 3026.46 x1e2 +
 3368.78 x1c3 + 3569.61 x1d3 + 3742.93 x1e3 +
 4166.28 x1c4 + 4414.66 x1d4 + 4629.02 x1e4 +
 5152.59 x1c5 + 5459.77 x1d5 + 5724.86 x1e5 +
 1556.14 x2a1 + 1729.13 x2b1 + 1863.56 x2c1 +
 1781.20 x2a2 + 1979.21 x2b2 + 2133.09 x2c2 +
 2038.81 x2a3 + 2265.46 x2b3 + 2441.59 x2c3 +
 2333.68 x2a4 + 2593.11 x2b4 + 2794.71 x2c4 +
 2671.20 x2a5 + 2968.14 x2b5 + 3198.91 x2c5 +
 2365.57 x3a1 + 2628.54 x3b1 + 2832.90 x3c1 +
 3284.60 x3a2 + 3649.73 x3b2 + 3933.49 x3c2 +
 4560.66 x3a3 + 5067.65 x3b3 + 5461.65 x3c3 +
 6332.48 x3a4 + 7036.43 x3b4 + 7583.50 x3c4 +
 8792.65 x3a5 + 9770.09 x3b5 + 10529.68 x3c5 +
 2611.29 x4a1 + 2901.58 x4b1 + 3127.17 x4c1 +
 3543.09 x4a2 + 3936.96 x4b2 + 4243.05 x4c2 +
 4807.39 x4a3 + 5341.80 x4b3 + 5757.11 x4c3 +
 6522.83 x4a4 + 7247.94 x4b4 + 7811.44 x4c4 +
 8850.39 x4a5 + 9834.25 x4b5 + 10598.83 x4c5 +
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 2463.21 x5a2 + 2737.04 x5b2 + 2949.83 x5c2 +
 3067.46 x5a3 + 3408.46 x5b3 + 3673.45 x5c3 +
 3819.94 x5a4 + 4244.59 x5b4 + 4574.59 x5c4 +
 4757.01 x5a5 + 5285.83 x5b5 + 5696.78 x5c5 +
 1809.11 x6a1 + 2010.23 x6b1 + 2166.51 x6c1 +
 2204.46 x6a2 + 2449.52 x6b2 + 2639.96 x6c2 +
 2686.20 x6a3 + 2984.81 x6b3 + 3216.87 x6c3 +
 3273.21 x6a4 + 3637.08 x6b4 + 3919.85 x6c4 +
 3988.51 x6a5 + 4431.89 x6b5 + 4776.46 x6c5 +
 2501.18 x7c1 + 2650.29 x7d1 + 2778.98 x7e1 +
 3429.28 x7c2 + 3633.72 x7d2 + 3810.16 x7e2 +
 4701.77 x7c3 + 4982.07 x7d3 + 5223.98 x7e3 +
 6446.44 x7c4 + 6830.75 x7d4 + 7162.42 x7e4 +
 8838.49 x7c5 + 9365.41 x7d5 + 9820.14 x7e5 +
 1717.42 x8a1 + 1908.34 x8b1 + 2056.70 x8c1 +
 2312.51 x8a2 + 2569.58 x8b2 + 2769.36 x8c2 +
 3113.80 x8a3 + 3459.95 x8b3 + 3728.95 x8c3 +
 4192.74 x8a4 + 4658.83 x8b4 + 5021.04 x8c4 +
 5645.53 x8a5 + 6273.12 x8b5 + 6760.84 x8c5 +
 1613.22 x9a1 + 1792.55 x9b1 + 1931.92 x9c1 +
 2064.23 x9a2 + 2293.71 x9b2 + 2472.03 x9c2 +
 2641.35 x9a3 + 2934.97 x9b3 + 3163.16 x9c3 +
 3379.80 x9a4 + 3755.52 x9b4 + 4047.50 x9c4 +
 4324.72 x9a5 + 4805.48 x9b5 + 5179.09 x9c5 +
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 1715.34 x10a2 + 1906.03 x10b2 + 2054.21 x10c2 +
 2012.63 x10a3 + 2236.36 x10b3 + 2410.23 x10c3 +
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 2770.70 x10a5 + 3078.70 x10b5 + 3318.06 x10c5 +
 1943.98 x11a1 + 2160.09 x11b1 + 2328.03 x11c1 +
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 1269.33 x12a2 + 1410.44 x12b2 + 1520.09 x12c2 +
 1269.33 x12a3 + 1410.44 x12b3 + 1520.09 x12c3 +
 1269.33 x12a4 + 1410.44 x12b4 + 1520.09 x12c4 +
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 2153.75 x13a2 + 2393.17 x13b2 + 2579.23 x13c2 +
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 3408.89 x13a4 + 3787.84 x13b4 + 4082.33 x13c4 +
 4288.67 x13a5 + 4765.42 x13b5 + 5135.91 x13c5 +
 1903.97 x14a1 + 2115.63 x14b1 + 2280.11 x14c1 +
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 2208.93 x15a3 + 2454.48 x15b3 + 2645.31 x15c3 +
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 2063.50 x16a1 + 2292.90 x16b1 + 2471.16 x16c1 +
 2989.06 x16a2 + 3321.34 x16b2 + 3579.56 x16c2 +
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 2234.22 x17a2 + 2482.59 x17b2 + 2675.60 x17c2 +
 2682.13 x17a3 + 2980.29 x17b3 + 3211.99 x17c3 +
 3219.83 x17a4 + 3577.76 x17b4 + 3855.92 x17c4 +
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 4205.32 x19c2 + 4456.02 x19d2 + 4672.38 x19e2 +
 7110.68 x19c3 + 7534.59 x19d3 + 7900.43 x19e3 +
 12023.30 x19c4 + 12740.08 x19d4 + 13358.67 x19e4 +
 20329.94 x19c5 + 21541.93 x19d5 + 22587.89 x19e5 +
 1912.61 x20a1 + 2125.22 x20b1 + 2290.45 x20c1 +
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 1895.50 x39a3 + 2106.21 x39b3 + 2269.96 x39c3 +
 2116.92 x39a4 + 2352.25 x39b4 + 2535.13 x39c4 +
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 1932.86 x44c3 + 2048.09 x44d3 + 2147.53 x44e3 +
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 2171.68 x44c5 + 2301.15 x44d5 + 2412.88 x44e5 +
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 1596.09 x55c3 + 1691.25 x55d3 + 1773.36 x55e3 +
 1638.53 x55c4 + 1736.21 x55d4 + 1820.51 x55e4 +
 1682.09 x55c5 + 1782.36 x55d5 + 1868.91 x55e5 +
 2260.44 x56c1 + 2395.20 x56d1 + 2511.50 x56e1 +
 2528.97 x56c2 + 2679.74 x56d2 + 2809.86 x56e2 +
 2829.41 x56c3 + 2998.08 x56d3 + 3143.66 x56e3 +
 3165.53 x56c4 + 3354.24 x56d4 + 3517.11 x56e4 +
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 2138.34 x57c3 + 2265.82 x57d3 + 2375.84 x57e3 +
 2253.41 x57c4 + 2387.75 x57d4 + 2503.69 x57e4 +
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 5022.49 x58c2 + 5321.91 x58d2 + 5580.32 x58e2 +
 7024.25 x58c3 + 7443.01 x58d3 + 7804.40 x58e3 +
 9823.83 x58c4 + 10409.49 x58d4 + 10914.92 x58e4 +
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 4416.62 x59c3 + 4679.92 x59d3 + 4907.15 x59e3 +
 5875.02 x59c4 + 6225.27 x59d4 + 6527.54 x59e4 +
 7815.00 x59c5 + 8280.90 x59d5 + 8682.98 x59e5 +
 2637.78 x60a1 + 2931.01 x60b1 + 3158.89 x60c1 +
 3590.16 x60a2 + 3989.26 x60b2 + 4299.41 x60c2 +
 4886.38 x60a3 + 5429.58 x60b3 + 5851.71 x60c3 +
 6650.62 x60a4 + 7389.94 x60b4 + 7964.48 x60c4 +
 9051.84 x60a5 + 10058.09 x60b5 + 10840.07 x60c5 +
 2715.72 x61a1 + 3017.61 x61b1 + 3252.22 x61c1 +
 4054.43 x61a2 + 4505.15 x61b2 + 4855.41 x61c2 +
 6053.07 x61a3 + 6725.96 x61b3 + 7248.88 x61c3 +
 9036.93 x61a4 + 10041.53 x61b4 + 10822.23 x61c4 +
 13491.70 x61a5 + 14991.51 x61b5 + 16157.05 x61c5 +
 3285.05 x62a1 + 3650.23 x62b1 + 3934.03 x62c1 +
 5038.71 x62a2 + 5598.84 x62b2 + 6034.14 x62c2 +
 7728.53 x62a3 + 8587.68 x62b3 + 9255.34 x62c3 +
 11854.27 x62a4 + 13172.05 x62b4 + 14196.14 x62c4 +
 18182.45 x62a5 + 20203.71 x62b5 + 21774.48 x62c5 +
 1948.89 x63a1 + 2165.54 x63b1 + 2333.91 x63c1 +
 2281.98 x63a2 + 2535.66 x63b2 + 2732.80 x63c2 +
 2672.00 x63a3 + 2969.03 x63b3 + 3199.86 x63c3 +
 3128.67 x63a4 + 3476.47 x63b4 + 3746.75 x63c4 +
 3663.39 x63a5 + 4070.63 x63b5 + 4387.11 x63c5 +
 1609.97 x64a1 + 1788.95 x64b1 + 1928.03 x64c1 +
 1625.61 x64a2 + 1806.32 x64b2 + 1946.76 x64c2 +
 1641.40 x64a3 + 1823.86 x64b3 + 1965.66 x64c3 +
 1657.34 x64a4 + 1841.58 x64b4 + 1984.76 x64c4 +
 1673.44 x64a5 + 1859.47 x64b5 + 2004.03 x64c5 +
 1932.39 x65a1 + 2147.21 x65b1 + 2314.15 x65c1 +
 2183.93 x65a2 + 2426.71 x65b2 + 2615.38 x65c2 +
 2468.22 x65a3 + 2742.60 x65b3 + 2955.83 x65c3 +

2789.51 x65a4 + 3099.60 x65b4 + 3340.59 x65c4 +
 3152.62 x65a5 + 3503.08 x65b5 + 3775.43 x65c5 +
 2445.14 x66a1 + 2716.95 x66b1 + 2928.19 x66c1 +
 3681.62 x66a2 + 4090.89 x66b2 + 4408.94 x66c2 +
 5543.37 x66a3 + 6159.60 x66b3 + 6638.49 x66c3 +
 8346.58 x66a4 + 9274.44 x66b4 + 9995.50 x66c4 +
 12567.36 x66a5 + 13964.41 x66b5 + 15050.10 x66c5 +
 3153.88 x67c1 + 3341.90 x67d1 + 3504.17 x67e1 +
 4398.57 x67c2 + 4660.79 x67d2 + 4887.10 x67e2 +
 6134.48 x67c3 + 6500.19 x67d3 + 6815.81 x67e3 +
 8555.47 x67c4 + 9065.51 x67d4 + 9505.69 x67e4 +
 11931.91 x67c5 + 12643.25 x67d5 + 13257.14 x67e5 +
 2378.48 x68c1 + 2520.27 x68d1 + 2642.64 x68e1 +
 3176.54 x68c2 + 3365.92 x68d2 + 3529.35 x68e2 +
 4242.39 x68c3 + 4495.31 x68d3 + 4713.57 x68e3 +
 5665.87 x68c4 + 6003.65 x68d4 + 6295.15 x68e4 +
 7566.98 x68c5 + 8018.09 x68d5 + 8407.41 x68e5 +
 2038.80 x69e1 + 2122.22 x69f1 + 2197.15 x69g1 +
 2278.36 x69e2 + 2371.58 x69f2 + 2455.31 x69g2 +
 2546.07 x69e3 + 2650.24 x69f3 + 2743.81 x69g3 +
 2845.23 x69e4 + 2961.65 x69f4 + 3066.21 x69g4 +
 3179.54 x69e5 + 3309.64 x69f5 + 3426.49 x69g5 +
 1588.42 x70c1 + 1683.12 x70d1 + 1764.84 x70e1 +
 1588.42 x70c2 + 1683.12 x70d2 + 1764.84 x70e2 +
 1588.42 x70c3 + 1683.12 x70d3 + 1764.84 x70e3 +
 1588.42 x70c4 + 1683.12 x70d4 + 1764.84 x70e4 +
 1588.42 x70c5 + 1683.12 x70d5 + 1764.84 x70e5 +
 1583.50 x71c5 + 1677.90 x71d5 + 1759.37 x71e5 +
 1603.16 x72c2 + 1698.73 x72d2 + 1781.21 x72e2 +
 1675.37 x72c3 + 1775.25 x72d3 + 1861.45 x72e3 +
 1750.84 x72c4 + 1855.21 x72d4 + 1945.29 x72e4 +
 1829.70 x72c5 + 1938.78 x72d5 + 2032.92 x72e5 +
 1610.42 x73c4 + 1706.43 x73d4 + 1789.28 x73e4 +
 1713.57 x73c5 + 1815.72 x73d5 + 1903.89 x73e5 +
 1312.64 x74a5 + 1458.56 x74b5 + 1571.95 x74c5 +
 1324.27 x75a3 + 1471.48 x75b3 + 1585.89 x75c3 +
 1380.25 x75a4 + 1533.69 x75b4 + 1652.93 x75c4 +
 1438.60 x75a5 + 1598.53 x75b5 + 1722.81 x75c5 +
 1297.99 x76a4 + 1442.29 x76b4 + 1554.42 x76c4 +
 1354.81 x76a5 + 1505.41 x76b5 + 1622.46 x76c5 +
 1555.89 x77c5 + 1648.64 x77d5 + 1728.69 x77e5 +
 1339.95 x78a5 + 1488.91 x78b5 + 1604.67 x78c5 +
 1571.23 x79c4 + 1664.90 x79d4 + 1745.74 x79e4 +
 1677.60 x79c5 + 1777.61 x79d5 + 1863.92 x79e5 +
 1622.86 x80c3 + 1719.61 x80d3 + 1803.10 x80e3 +
 1725.90 x80c4 + 1828.79 x80d4 + 1917.59 x80e4 +
 1835.48 x80c5 + 1944.90 x80d5 + 2039.34 x80e5 +
 1622.86 x81c5 + 1719.61 x81d5 + 1803.10 x81e5 +
 1593.29 x82c3 + 1688.28 x82d3 + 1770.25 x82e3 +
 1693.76 x82c4 + 1794.73 x82d4 + 1881.87 x82e4 +
 1800.55 x82c5 + 1907.89 x82d5 + 2000.53 x82e5 +
 1314.74 x83a3 + 1460.89 x83b3 + 1574.47 x83c3 +
 1400.34 x83a4 + 1556.01 x83b4 + 1676.99 x83c4 +
 1491.53 x83a5 + 1657.33 x83b5 + 1786.18 x83c5 +

1323.20 x84a3 + 1470.30 x84b3 + 1584.61 x84c3 +
 1407.95 x84a4 + 1564.46 x84b4 + 1686.09 x84c4 +
 1498.11 x84a5 + 1664.65 x84b5 + 1794.07 x84c5 +
 1359.55 x85a5 + 1510.69 x85b5 + 1628.14 x85c5 +
 1311.07 x86a4 + 1456.82 x86b4 + 1570.08 x86c4 +
 1396.71 x86a5 + 1551.98 x86b5 + 1672.64 x86c5 +
 1635.46 x87c3 + 1732.96 x87d3 + 1817.10 x87e3 +
 1732.78 x87c4 + 1836.08 x87d4 + 1925.23 x87e4 +
 1835.89 x87c5 + 1945.34 x87d5 + 2039.79 x87e5 +
 1592.56 x88c4 + 1687.50 x88d4 + 1769.44 x88e4 +
 1693.03 x88c5 + 1793.96 x88d5 + 1881.07 x88e5 +
 1363.75 x89a5 + 1515.36 x89b5 + 1633.17 x89c5 +
 1338.40 x90a3 + 1487.18 x90b3 + 1602.81 x90c3 +
 1422.22 x90a4 + 1580.32 x90b4 + 1703.19 x90c4 +
 1511.29 x90a5 + 1679.30 x90b5 + 1809.86 x90c5 +
 1358.33 x91a5 + 1509.33 x91b5 + 1626.67 x91c5 +
 1620.91 x92c3 + 1717.54 x92d3 + 1800.94 x92e3 +
 1719.27 x92c4 + 1821.77 x92d4 + 1910.23 x92e4 +
 1823.60 x92c5 + 1932.32 x92d5 + 2026.14 x92e5 +
 1568.72 x93c4 + 1662.24 x93d4 + 1742.95 x93e4 +
 1672.24 x93c5 + 1771.94 x93d5 + 1857.97 x93e5 +
 1688.36 x94c2 + 1789.01 x94d2 + 1875.88 x94e2 +
 1825.84 x94c3 + 1934.69 x94d3 + 2028.62 x94e3 +
 1974.50 x94c4 + 2092.22 x94d4 + 2193.80 x94e4 +
 2135.28 x94c5 + 2262.58 x94d5 + 2372.43 x94e5 +
 1689.09 x95c4 + 1789.79 x95d4 + 1876.69 x95e4 +
 1826.56 x95c5 + 1935.45 x95d5 + 2029.42 x95e5 +
 1696.52 x96c2 + 1797.66 x96d2 + 1884.94 x96e2 +
 1834.89 x96c3 + 1944.28 x96d3 + 2038.68 x96e3 +
 1984.54 x96c4 + 2102.85 x96d4 + 2204.96 x96e4 +
 2146.40 x96c5 + 2274.36 x96d5 + 2384.79 x96e5 +
 1616.19 x97c2 + 1712.54 x97d2 + 1795.70 x97e2 +
 1749.66 x97c3 + 1853.96 x97d3 + 1943.98 x97e3 +
 1894.14 x97c4 + 2007.06 x97d4 + 2104.51 x97e4 +
 2050.55 x97c5 + 2172.80 x97d5 + 2278.30 x97e5 +
 1602.93 x98c5 + 1698.49 x98d5 + 1780.96 x98e5 +
 1601.93 x99c5 + 1697.43 x99d5 + 1779.85 x99e5 +
 1553.19 x100c4 + 1645.78 x100d4 + 1725.69 x100e4 +
 1640.94 x100c5 + 1738.76 x100d5 + 1823.19 x100e5 +
 1569.95 x101c5 + 1663.54 x101d5 + 1744.31 x101e5 +
 1599.81 x102c5 + 1695.19 x102d5 + 1777.50 x102e5 +
 1602.74 x103a5 + 1698.29 x103b5 + 1780.76 x103c5 +
 1357.75 x104a5 + 1508.69 x104b5 + 1625.98 x104c5 +
 1385.06 x105a4 + 1539.03 x105b4 + 1658.69 x105c4 +
 1476.38 x105a5 + 1640.50 x105b5 + 1768.04 x105c5 +
 1327.93 x106a5 + 1475.55 x106b5 + 1590.27 x106c5 +
 1322.44 x107a3 + 1469.45 x107b3 + 1583.69 x107c3 +
 1416.80 x107a4 + 1574.29 x107b4 + 1696.69 x107c4 +
 1517.89 x107a5 + 1686.62 x107b5 + 1817.75 x107c5 +
 1346.15 x108a2 + 1495.80 x108b2 + 1612.09 x108c2 +
 1439.45 x108a3 + 1599.47 x108b3 + 1723.82 x108c3 +
 1539.21 x108a4 + 1710.32 x108b4 + 1843.29 x108c4 +
 1645.89 x108a5 + 1828.86 x108b5 + 1971.05 x108c5 +
 1355.31 x109a2 + 1505.97 x109b2 + 1623.06 x109c2 +

1448.52 x109a3 + 1609.54 x109b3 + 1734.68 x109c3 +
 1548.13 x109a4 + 1720.23 x109b4 + 1853.97 x109c4 +
 1654.59 x109a5 + 1838.53 x109b5 + 1981.47 x109c5 +
 1367.35 x110a4 + 1519.35 x110b4 + 1637.47 x110c4 +
 1458.83 x110a5 + 1621.00 x110b5 + 1747.03 x110c5 +
 1327.41 x111a3 + 1474.98 x111b3 + 1589.65 x111c3 +
 1422.53 x111a4 + 1580.67 x111b4 + 1703.56 x111c4 +
 1524.46 x111a5 + 1693.93 x111b5 + 1825.63 x111c5 +
 1739.18 x112e5 + 1810.34 x112f5 + 1874.25 x112g5 +
 1559.46 x113c5 + 1652.43 x113d5 + 1732.66 x113e5 +
 1561.66 x114c4 + 1654.76 x114d4 + 1735.10 x114e4 +
 1637.60 x114c5 + 1735.23 x114d5 + 1819.48 x114e5 +
 1567.45 x115c3 + 1660.89 x115d3 + 1741.54 x115e3 +
 1642.47 x115c4 + 1740.39 x115d4 + 1824.89 x115e4 +
 1721.09 x115c5 + 1823.69 x115d5 + 1912.24 x115e5 +
 1734.29 x116e4 + 1805.25 x116f4 + 1868.99 x116g4 +
 1818.67 x116e5 + 1893.08 x116f5 + 1959.92 x116g5 +
 1563.12 x117c4 + 1656.31 x117d4 + 1736.73 x117e4 +
 1639.06 x117c5 + 1736.77 x117d5 + 1821.10 x117e5 +
 1731.85 x118e3 + 1802.71 x118f3 + 1866.35 x118g3+
 1816.24 x118e4 + 1890.55 x118f4 + 1957.30 x118g4 +
 1904.74 x118e5 + 1982.68 x118f5 + 2052.68 x118g5

SUBJECT TO

18.121 x1c1 + 19.187 x1d1+ 20.107 x1e1+
 19.114 x2a1+ 21.258 x2b1+ 22.848 x2c1+
 23.398 x3a1+ 26.022 x3b1+ 27.969 x3c1+
 12.193 x4a1+ 13.561 x4b1+ 14.576 x4c1+
 20.103 x5a1+ 22.357 x5b1+ 24.030 x5c1+
 21.091 x6a1+ 23.457 x6b1+ 25.212 x6c1+
 20.091 x7c1+ 21.273 x7d1+ 22.292 x7e1+
 19.773 x8a1+ 21.991 x8b1+ 23.636 x8c1+
 12.193 x9a1+ 13.561 x9b1+ 14.576 x9c1+
 13.512 x10a1 + 15.027 x10b1 + 16.151 x10c1 +
 14.500 x11a1 + 16.126 x11b1 + 17.333 x11c1 +
 11.864 x12a1 + 13.194 x12b1 + 14.182 x12c1 +
 14.500 x13a1 + 16.126 x13b1 + 17.333 x13c1 +
 12.193 x14a1 + 13.561 x14b1 + 14.576 x14c1 +
 16.807 x15a1 + 18.692 x15b1 + 20.091 x15c1 +
 21.091 x16a1 + 23.457 x16b1 + 25.212 x16c1 +
 20.103 x17a1 + 22.357 x17b1 + 24.030 x17c1 +
 12.193 x18a1 + 13.561 x18b1 + 14.576 x18c1 +
 17.727 x19c1 + 18.770 x19d1 + 19.670 x19e1 +
 9.557 x20a1 + 10.629 x20b1 + 11.424 x20c1 +
 20.432 x21a1 + 22.724 x21b1 + 24.424 x21c1 +
 25.705 x22a1 + 28.588 x22b1 + 30.727 x22c1 +
 20.878 x23c1 + 22.107 x23d1 + 23.167 x23e1 +
 13.512 x24a1 + 15.027 x24b1 + 16.151 x24c1 +
 18.785 x25a1 + 20.891 x25b1 + 22.454 x25c1 +
 17.137 x26a1 + 19.059 x26b1 + 20.485 x26c1 +
 14.500 x27a1 + 16.126 x27b1 + 17.333 x27c1 +
 18.125 x28a1 + 20.158 x28b1 + 21.666 x28c1 +
 14.500 x29a1 + 16.126 x29b1 + 17.333 x29c1 +
 22.848 x30c1 + 24.192 x30d1 + 25.352 x30e1 +
 7.879 x31c1 + 8.342 x31d1 + 8.742 x31e1 +

18.909 x32c1 + 20.021 x32d1 + 20.981 x32e1 +
 28.757 x33c1 + 30.449 x33d1 + 31.909 x33e1 +
 2.758 x34c1 + 2.920 x34d1 + 3.060 x34e1 +
 26.000 x35c1 + 27.529 x35d1 + 28.849 x35e1 +
 11.534 x36a1 + 12.828 x36b1 + 13.788 x36c1 +
 17.466 x37a1 + 19.425 x37b1 + 20.878 x37c1 +
 26.000 x38c1 + 27.529 x38d1 + 28.849 x38e1 +
 8.898 x39a1 + 9.896 x39b1 + 10.636 x39c1 +
 19.114 x40a1 + 21.258 x40b1 + 22.848 x40c1 +
 8.898 x41a1 + 9.896 x41b1 + 10.636 x41c1 +
 12.606 x42c1 + 13.348 x42d1 + 13.987 x42e1 +
 22.848 x43c1 + 24.192 x43d1 + 25.352 x43e1 +
 15.757 x44c1 + 16.684 x44d1 + 17.484 x44e1 +
 17.333 x45c1 + 18.353 x45d1 + 19.233 x45e1 +
 7.250 x46a1 + 8.063 x46b1 + 8.667 x46c1 +
 12.193 x47a1 + 13.561 x47b1 + 14.576 x47c1 +
 8.898 x48a1 + 9.896 x48b1 + 10.636 x48c1 +
 17.466 x49a1 + 19.425 x49b1 + 20.878 x49c1 +
 10.216 x50a1 + 11.362 x50b1 + 12.212 x50c1 +
 17.466 x51a1 + 19.425 x51b1 + 20.878 x51c1 +
 13.841 x52a1 + 15.393 x52b1 + 16.545 x52c1 +
 5.602 x53a1 + 6.231 x53b1 + 6.697 x53c1 +
 17.333 x54c1 + 18.353 x54d1 + 19.233 x54e1 +
 15.757 x55c1 + 16.684 x55d1 + 17.484 x55e1 +
 22.848 x56c1 + 24.192 x56d1 + 25.352 x56e1 +
 17.727 x57c1 + 18.770 x57d1 + 19.670 x57e1 +
 25.212 x58c1 + 26.695 x58d1 + 27.975 x58e1 +
 20.878 x59c1 + 22.107 x59d1 + 23.167 x59e1 +
 30.319 x60a1 + 33.719 x60b1 + 36.242 x60c1 +
 21.091 x61a1 + 23.457 x61b1 + 25.212 x61c1 +
 22.739 x62a1 + 25.289 x62b1 + 27.181 x62c1 +
 21.091 x63a1 + 23.457 x63b1 + 25.212 x63c1 +
 1.318 x64a1 + 1.466 x64b1 + 1.576 x64c1 +
 30.319 x65a1 + 33.719 x65b1 + 36.242 x65c1 +
 17.466 x66a1 + 19.425 x66b1 + 20.878 x66c1 +
 25.212 x67c1 + 26.695 x67d1 + 27.975 x67e1 +
 17.727 x68c1 + 18.770 x68d1 + 19.670 x68e1 +
 10.928 x69e1 + 11.375 x69f1 + 11.795 x69g1 +
 14.576 x70c1 + 15.433 x70d1 + 16.173 x70e1 $\leq 170.0^*$
 - 18.090 x1c1 - 19.163 x1d1 - 20.089 x1e1
 - 19.059 x2a1 - 21.211 x2b1 - 22.809 x2c1
 - 23.331 x3a1 - 25.965 x3b1 - 27.921 x3c1
 - 12.158 x4a1 - 13.531 x4b1 - 14.551 x4c1
 - 20.045 x5a1 - 22.308 x5b1 - 23.989 x5c1
 - 21.030 x6a1 - 23.405 x6b1 - 25.169 x6c1
 - 20.056 x7c1 - 21.246 x7d1 - 22.273 x7e1
 - 19.716 x8a1 - 21.942 x8b1 - 23.596 x8c1
 - 12.158 x9a1 - 13.531 x9b1 - 14.551 x9c1
 - 13.473 x10a1 - 14.994 x10b1 - 16.124 x10c1
 - 14.458 x11a1 - 16.091 x11b1 - 17.303 x11c1
 - 11.830 x12a1 - 13.165 x12b1 - 14.157 x12c1
 - 14.458 x13a1 - 16.091 x13b1 - 17.303 x13c1
 - 12.158 x14a1 - 13.531 x14b1 - 14.551 x14c1
 - 16.759 x15a1 - 18.651 x15b1 - 20.056 x15c1

* All coefficients should be multiplied by 10^5

- 21.030 x16a1 - 23.405 x16b1 - 25.169 x16c1
 - 20.045 x17a1 - 22.308 x17b1 - 23.989 x17c1
 - 12.158 x18a1 - 13.531 x18b1 - 14.551 x18c1
 - 17.697 x19c1 - 18.746 x19d1 - 19.652 x19e1
 - 9.529 x20a1 - 10.605 x20b1 - 11.405 x20c1
 - 20.373 x21a1 - 22.673 x21b1 - 24.382 x21c1
 - 25.631 x22a1 - 28.525 x22b1 - 30.674 x22c1
 - 20.843 x23c1 - 22.079 x23d1 - 23.146 x23e1
 - 13.473 x24a1 - 14.994 x24b1 - 16.124 x24c1
 - 18.730 x25a1 - 20.845 x25b1 - 22.416 x25c1
 - 17.087 x26a1 - 19.016 x26b1 - 20.450 x26c1
 - 14.458 x27a1 - 16.091 x27b1 - 17.303 x27c1
 - 18.073 x28a1 - 20.113 x28b1 - 21.629 x28c1
 - 14.458 x29a1 - 16.091 x29b1 - 17.303 x29c1
 - 22.809 x30c1 - 24.162 x30d1 - 25.330 x30e1
 - 7.865 x31c1 - 8.332 x31d1 - 8.734 x31e1
 - 18.876 x32c1 - 19.996 x32d1 - 20.963 x32e1
 - 28.708 x33c1 - 30.410 x33d1 - 31.881 x33e1
 - 2.753 x34c1 - 2.916 x34d1 - 3.057 x34e1
 - 25.955 x35c1 - 27.494 x35d1 - 28.824 x35e1
 - 11.501 x36a1 - 12.799 x36b1 - 13.764 x36c1
 - 17.416 x37a1 - 19.382 x37b1 - 20.843 x37c1
 - 25.955 x38c1 - 27.494 x38d1 - 28.824 x38e1
 - 8.872 x39a1 - 9.874 x39b1 - 10.618 x39c1
 - 19.059 x40a1 - 21.211 x40b1 - 22.809 x40c1
 - 8.872 x41a1 - 9.874 x41b1 - 10.618 x41c1
 - 12.584 x42c1 - 13.331 x42d1 - 13.975 x42e1
 - 22.809 x43c1 - 24.162 x43d1 - 25.330 x43e1
 - 15.730 x44c1 - 16.663 x44d1 - 17.469 x44e1
 - 17.303 x45c1 - 18.330 x45d1 - 19.216 x45e1
 - 7.229 x46a1 - 8.045 x46b1 - 8.652 x46c1
 - 12.158 x47a1 - 13.531 x47b1 - 14.551 x47c1
 - 8.872 x48a1 - 9.874 x48b1 - 10.618 x48c1
 - 17.416 x49a1 - 19.382 x49b1 - 20.843 x49c1
 - 10.187 x50a1 - 11.337 x50b1 - 12.191 x50c1
 - 17.416 x51a1 - 19.382 x51b1 - 20.843 x51c1
 - 13.801 x52a1 - 15.359 x52b1 - 16.517 x52c1
 - 5.586 x53a1 - 6.217 x53b1 - 6.685 x53c1
 - 17.303 x54c1 - 18.330 x54d1 - 19.216 x54e1
 - 15.730 x55c1 - 16.663 x55d1 - 17.469 x55e1
 - 22.809 x56c1 - 24.162 x56d1 - 25.330 x56e1
 - 17.697 x57c1 - 18.746 x57d1 - 19.652 x57e1
 - 25.169 x58c1 - 26.661 x58d1 - 27.950 x58e1
 - 20.843 x59c1 - 22.079 x59d1 - 23.146 x59e1
 - 30.231 x60a1 - 33.644 x60b1 - 36.180 x60c1
 - 21.030 x61a1 - 23.405 x61b1 - 25.169 x61c1
 - 22.673 x62a1 - 25.233 x62b1 - 27.135 x62c1
 - 21.030 x63a1 - 23.405 x63b1 - 25.169 x63c1
 - 1.314 x64a1 - 1.463 x64b1 - 1.573 x64c1
 - 30.231 x65a1 - 33.644 x65b1 - 36.180 x65c1
 - 17.416 x66a1 - 19.382 x66b1 - 20.843 x66c1
 - 25.169 x67c1 - 26.661 x67d1 - 27.950 x67e1
 - 17.697 x68c1 - 18.746 x68d1 - 19.652 x68e1
 - 10.918 x69e1 - 11.368 x69f1 - 11.792 x69g1

- 14.551 x70c1 - 15.413 x70d1 - 16.159 x70e1
 + 19.208 x1c2 + 20.338 x1d2 + 21.313 x1e2
 + 20.261 x2a2 + 22.533 x2b2 + 24.219 x2c2
 + 24.802 x3a2 + 27.584 x3b2 + 29.647 x3c2
 + 12.925 x4a2 + 14.375 x4b2 + 15.450 x4c2
 + 21.309 x5a2 + 23.699 x5b2 + 25.472 x5c2
 + 22.357 x6a2 + 24.864 x6b2 + 26.724 x6c2
 + 21.296 x7c2 + 22.549 x7d2 + 23.630 x7e2
 + 20.960 x8a2 + 23.310 x8b2 + 25.054 x8c2
 + 12.925 x9a2 + 14.375 x9b2 + 15.450 x9c2
 + 14.322 x10a2 + 15.929 x10b2 + 17.120 x10c2
 + 15.370 x11a2 + 17.094 x11b2 + 18.373 x11c2
 + 12.576 x12a2 + 13.986 x12b2 + 15.032 x12c2
 + 15.370 x13a2 + 17.094 x13b2 + 18.373 x13c2
 + 12.925 x14a2 + 14.375 x14b2 + 15.450 x14c2
 + 17.816 x15a2 + 19.814 x15b2 + 21.296 x15c2
 + 22.357 x16a2 + 24.864 x16b2 + 26.724 x16c2
 + 21.309 x17a2 + 23.699 x17b2 + 25.472 x17c2
 + 12.925 x18a2 + 14.375 x18b2 + 15.450 x18c2
 + 18.791 x19c2 + 19.896 x19d2 + 20.850 x19e2
 + 10.130 x20a2 + 11.267 x20b2 + 12.110 x20c2
 + 21.658 x21a2 + 24.087 x21b2 + 25.889 x21c2
 + 27.248 x22a2 + 30.303 x22b2 + 32.570 x22c2
 + 22.131 x23c2 + 23.433 x23d2 + 24.557 x23e2
 + 14.322 x24a2 + 15.929 x24b2 + 17.120 x24c2
 + 19.912 x25a2 + 22.145 x25b2 + 23.801 x25c2
 + 18.165 x26a2 + 20.202 x26b2 + 21.714 x26c2
 + 15.370 x27a2 + 17.094 x27b2 + 18.373 x27c2
 + 19.213 x28a2 + 21.368 x28b2 + 22.966 x28c2
 + 15.370 x29a2 + 17.094 x29b2 + 18.373 x29c2
 + 24.219 x30c2 + 25.644 x30d2 + 26.873 x30e2
 + 8.351 x31c2 + 8.843 x31d2 + 9.267 x31e2
 + 20.043 x32c2 + 21.223 x32d2 + 22.240 x32e2
 + 30.483 x33c2 + 32.276 x33d2 + 33.823 x33e2
 + 2.923 x34c2 + 3.095 x34d2 + 3.243 x34e2
 + 27.560 x35c2 + 29.181 x35d2 + 30.580 x35e2
 + 12.226 x36a2 + 13.598 x36b2 + 14.615 x36c2
 + 18.514 x37a2 + 20.591 x37b2 + 22.131 x37c2
 + 27.560 x38c2 + 29.181 x38d2 + 30.580 x38e2
 + 9.432 x39a2 + 10.490 x39b2 + 11.274 x39c2
 + 20.261 x40a2 + 22.533 x40b2 + 24.219 x40c2
 + 9.432 x41a2 + 10.490 x41b2 + 11.274 x41c2
 + 13.362 x42c2 + 14.148 x42d2 + 14.827 x42e2
 + 24.219 x43c2 + 25.644 x43d2 + 26.873 x43e2
 + 16.703 x44c2 + 17.685 x44d2 + 18.533 x44e2
 + 18.373 x45c2 + 19.454 x45d2 + 20.387 x45e2
 + 7.685 x46a2 + 8.547 x46b2 + 9.187 x46c2
 + 12.925 x47a2 + 14.375 x47b2 + 15.450 x47c2
 + 9.432 x48a2 + 10.490 x48b2 + 11.274 x48c2
 + 18.514 x49a2 + 20.591 x49b2 + 22.131 x49c2
 + 10.829 x50a2 + 12.044 x50b2 + 12.945 x50c2
 + 18.514 x51a2 + 20.591 x51b2 + 22.131 x51c2
 + 14.672 x52a2 + 16.317 x52b2 + 17.538 x52c2
 + 5.939 x53a2 + 6.605 x53b2 + 7.099 x53c2

$$\begin{aligned}
& + 18.373 \, x54c2 + 19.454 \, x54d2 + 20.387 \, x54e2 \\
& + 16.703 \, x55c2 + 17.685 \, x55d2 + 18.533 \, x55e2 \\
& + 24.219 \, x56c2 + 25.644 \, x56d2 + 26.873 \, x56e2 \\
& + 18.791 \, x57c2 + 19.896 \, x57d2 + 20.850 \, x57e2 \\
& + 26.724 \, x58c2 + 28.297 \, x58d2 + 29.653 \, x58e2 \\
& + 22.131 \, x59c2 + 23.433 \, x59d2 + 24.557 \, x59e2 \\
& + 32.138 \, x60a2 + 35.742 \, x60b2 + 38.416 \, x60c2 \\
& + 22.357 \, x61a2 + 24.864 \, x61b2 + 26.724 \, x61c2 \\
& + 24.104 \, x62a2 + 26.807 \, x62b2 + 28.812 \, x62c2 \\
& + 22.357 \, x63a2 + 24.864 \, x63b2 + 26.724 \, x63c2 \\
& + 1.397 \, x64a2 + 1.554 \, x64b2 + 1.670 \, x64c2 \\
& + 32.138 \, x65a2 + 35.742 \, x65b2 + 38.416 \, x65c2 \\
& + 18.514 \, x66a2 + 20.591 \, x66b2 + 22.131 \, x66c2 \\
& + 26.724 \, x67c2 + 28.297 \, x67d2 + 29.653 \, x67e2 \\
& + 18.791 \, x68c2 + 19.896 \, x68d2 + 20.850 \, x68e2 \\
& + 11.583 \, x69e2 + 12.057 \, x69f2 + 12.503 \, x69g2 \\
& + 15.450 \, x70c2 + 16.359 \, x70d2 + 17.143 \, x70e2 + \\
& 13.362 \, x72c2 + 14.148 \, x72d2 + 14.827 \, x72e2 + \\
& 27.560 \, x94c2 + 29.181 \, x94d2 + 30.580 \, x94e2 + \\
& 2.923 \, x96c2 + 3.095 \, x96d2 + 3.243 \, x96e2 + \\
& 30.483 \, x97c2 + 32.276 \, x97d2 + 33.823 \, x97e2 + \\
& 18.864 \, x108a2 + 20.979 \, x108b2 + 22.549 \, x108c2 + \\
& 12.226 \, x109a2 + 13.598 \, x109b2 + 14.615 \, x109c2 \leq 320.0^* \\
& - 19.175 \, x1c2 - 20.312 \, x1d2 - 21.294 \, x1e2 \\
& - 20.202 \, x2a2 - 22.483 \, x2b2 - 24.178 \, x2c2 \\
& - 24.730 \, x3a2 - 27.523 \, x3b2 - 29.597 \, x3c2 \\
& - 12.888 \, x4a2 - 14.343 \, x4b2 - 15.424 \, x4c2 \\
& - 21.247 \, x5a2 - 23.646 \, x5b2 - 25.428 \, x5c2 \\
& - 22.292 \, x6a2 - 24.809 \, x6b2 - 26.679 \, x6c2 \\
& - 21.260 \, x7c2 - 22.520 \, x7d2 - 23.609 \, x7e2 \\
& - 20.899 \, x8a2 - 23.259 \, x8b2 - 25.011 \, x8c2 \\
& - 12.888 \, x9a2 - 14.343 \, x9b2 - 15.424 \, x9c2 \\
& - 14.281 \, x10a2 - 15.893 \, x10b2 - 17.091 \, x10c2 \\
& - 15.326 \, x11a2 - 17.056 \, x11b2 - 18.342 \, x11c2 \\
& - 12.539 \, x12a2 - 13.955 \, x12b2 - 15.007 \, x12c2 \\
& - 15.326 \, x13a2 - 17.056 \, x13b2 - 18.342 \, x13c2 \\
& - 12.888 \, x14a2 - 14.343 \, x14b2 - 15.424 \, x14c2 \\
& - 17.764 \, x15a2 - 19.770 \, x15b2 - 21.260 \, x15c2 \\
& - 22.292 \, x16a2 - 24.809 \, x16b2 - 26.679 \, x16c2 \\
& - 21.247 \, x17a2 - 23.646 \, x17b2 - 25.428 \, x17c2 \\
& - 12.888 \, x18a2 - 14.343 \, x18b2 - 15.424 \, x18c2 \\
& - 18.758 \, x19c2 - 19.871 \, x19d2 - 20.832 \, x19e2 \\
& - 10.101 \, x20a2 - 11.242 \, x20b2 - 12.089 \, x20c2 \\
& - 21.596 \, x21a2 - 24.034 \, x21b2 - 25.845 \, x21c2 \\
& - 27.169 \, x22a2 - 30.236 \, x22b2 - 32.515 \, x22c2 \\
& - 22.093 \, x23c2 - 23.403 \, x23d2 - 24.535 \, x23e2 \\
& - 14.281 \, x24a2 - 15.893 \, x24b2 - 17.091 \, x24c2 \\
& - 19.854 \, x25a2 - 22.096 \, x25b2 - 23.761 \, x25c2 \\
& - 18.112 \, x26a2 - 20.157 \, x26b2 - 21.676 \, x26c2 \\
& - 15.326 \, x27a2 - 17.056 \, x27b2 - 18.342 \, x27c2 \\
& - 19.157 \, x28a2 - 21.320 \, x28b2 - 22.927 \, x28c2 \\
& - 15.326 \, x29a2 - 17.056 \, x29b2 - 18.342 \, x29c2 \\
& - 24.178 \, x30c2 - 25.611 \, x30d2 - 26.850 \, x30e2 \\
& - 8.337 \, x31c2 - 8.831 \, x31d2 - 9.258 \, x31e2
\end{aligned}$$

* All coefficients should be multiplied by 10^5

- 20.009 x32c2 - 21.196 x32d2 - 22.220 x32e2
 - 30.430 x33c2 - 32.235 x33d2 - 33.793 x33e2
 - 2.918 x34c2 - 3.091 x34d2 - 3.240 x34e2
 - 27.512 x35c2 - 29.144 x35d2 - 30.553 x35e2
 - 12.191 x36a2 - 13.567 x36b2 - 14.590 x36c2
 - 18.461 x37a2 - 20.545 x37b2 - 22.093 x37c2
 - 27.512 x38c2 - 29.144 x38d2 - 30.553 x38e2
 - 9.405 x39a2 - 10.466 x39b2 - 11.255 x39c2
 - 20.202 x40a2 - 22.483 x40b2 - 24.178 x40c2
 - 9.405 x41a2 - 10.466 x41b2 - 11.255 x41c2
 - 13.339 x42c2 - 14.130 x42d2 - 14.814 x42e2
 - 24.178 x43c2 - 25.611 x43d2 - 26.850 x43e2
 - 16.674 x44c2 - 17.663 x44d2 - 18.517 x44e2
 - 18.342 x45c2 - 19.429 x45d2 - 20.369 x45e2
 - 7.663 x46a2 - 8.528 x46b2 - 9.171 x46c2
 - 12.888 x47a2 - 14.343 x47b2 - 15.424 x47c2
 - 9.405 x48a2 - 10.466 x48b2 - 11.255 x48c2
 - 18.461 x49a2 - 20.545 x49b2 - 22.093 x49c2
 - 10.798 x50a2 - 12.017 x50b2 - 12.923 x50c2
 - 18.461 x51a2 - 20.545 x51b2 - 22.093 x51c2
 - 14.629 x52a2 - 16.281 x52b2 - 17.508 x52c2
 - 5.921 x53a2 - 6.590 x53b2 - 7.087 x53c2
 - 18.342 x54c2 - 19.429 x54d2 - 20.369 x54e2
 - 16.674 x55c2 - 17.663 x55d2 - 18.517 x55e2
 - 24.178 x56c2 - 25.611 x56d2 - 26.850 x56e2
 - 18.758 x57c2 - 19.871 x57d2 - 20.832 x57e2
 - 26.679 x58c2 - 28.261 x58d2 - 29.627 x58e2
 - 22.093 x59c2 - 23.403 x59d2 - 24.535 x59e2
 - 32.045 x60a2 - 35.663 x60b2 - 38.351 x60c2
 - 22.292 x61a2 - 24.809 x61b2 - 26.679 x61c2
 - 24.034 x62a2 - 26.747 x62b2 - 28.763 x62c2
 - 22.292 x63a2 - 24.809 x63b2 - 26.679 x63c2
 - 1.393 x64a2 - 1.551 x64b2 - 1.667 x64c2
 - 32.045 x65a2 - 35.663 x65b2 - 38.351 x65c2
 - 18.461 x66a2 - 20.545 x66b2 - 22.093 x66c2
 - 26.679 x67c2 - 28.261 x67d2 - 29.627 x67e2
 - 18.758 x68c2 - 19.871 x68d2 - 20.832 x68e2
 - 11.573 x69e2 - 12.051 x69f2 - 12.500 x69g2
 - 15.424 x70c2 - 16.338 x70d2 - 17.128 x70e2
 + 20.361 x1c3 + 21.559 x1d3 + 22.592 x1e3
 + 21.477 x2e3 + 23.885 x2b3 + 25.672 x2c3
 + 26.290 x3a3 + 29.239 x3b3 + 31.426 x3c3
 + 13.701 x4a3 + 15.237 x4b3 + 16.377 x4c3
 + 22.587 x5a3 + 25.121 x5b3 + 27.000 x5c3
 + 23.698 x6a3 + 26.356 x6b3 + 28.328 x6c3
 + 22.574 x7c3 + 23.902 x7d3 + 25.048 x7e3
 + 22.217 x8a3 + 24.709 x8b3 + 26.557 x8c3
 + 13.701 x9a3 + 15.237 x9b3 + 16.377 x9c3
 + 15.182 x10a3 + 16.884 x10b3 + 18.148 x10c3
 + 16.293 x11a3 + 18.120 x11b3 + 19.475 x11c3
 + 13.330 x12a3 + 14.825 x12b3 + 15.934 x12c3
 + 16.293 x13a3 + 18.120 x13b3 + 19.475 x13c3
 + 13.701 x14a3 + 15.237 x14b3 + 16.377 x14c3
 + 18.885 x15a3 + 21.002 x15b3 + 22.574 x15c3

+ 23.698 x16a3 + 26.356 x16b3 + 28.328 x16c3
 + 22.587 x17a3 + 25.121 x17b3 + 27.000 x17c3
 + 13.701 x18a3 + 15.237 x18b3 + 16.377 x18c3
 + 19.918 x19c3 + 21.090 x19d3 + 22.101 x19e3
 + 10.738 x20a3 + 11.943 x20b3 + 12.836 x20c3
 + 22.958 x21a3 + 25.532 x21b3 + 27.443 x21c3
 + 28.882 x22a3 + 32.121 x22b3 + 34.525 x22c3
 + 23.459 x23c3 + 24.839 x23d3 + 26.030 x23e3
 + 15.182 x24a3 + 16.884 x24b3 + 18.148 x24c3
 + 21.106 x25a3 + 23.473 x25b3 + 25.230 x25c3
 + 19.255 x26a3 + 21.414 x26b3 + 23.016 x26c3
 + 16.293 x27a3 + 18.120 x27b3 + 19.475 x27c3
 + 20.366 x28a3 + 22.650 x28b3 + 24.344 x28c3
 + 16.293 x29a3 + 18.120 x29b3 + 19.475 x29c3
 + 25.672 x30c3 + 27.183 x30d3 + 28.486 x30e3
 + 8.852 x31c3 + 9.373 x31d3 + 9.823 x31e3
 + 21.246 x32c3 + 22.496 x32d3 + 23.574 x32e3
 + 32.311 x33c3 + 34.213 x33d3 + 35.853 x33e3
 + 3.098 x34c3 + 3.281 x34d3 + 3.438 x34e3
 + 29.213 x35c3 + 30.932 x35d3 + 32.415 x35e3
 + 12.960 x36a3 + 14.413 x36b3 + 15.492 x36c3
 + 19.625 x37a3 + 21.826 x37b3 + 23.459 x37c3
 + 29.213 x38c3 + 30.932 x38d3 + 32.415 x38e3
 + 9.998 x39a3 + 11.119 x39b3 + 11.951 x39c3
 + 21.477 x40a3 + 23.885 x40b3 + 25.672 x40c3
 + 9.998 x41a3 + 11.119 x41b3 + 11.951 x41c3
 + 14.164 x42c3 + 14.997 x42d3 + 15.716 x42e3
 + 25.672 x43c3 + 27.183 x43d3 + 28.486 x43e3
 + 17.705 x44c3 + 18.747 x44d3 + 19.645 x44e3
 + 19.475 x45c3 + 20.621 x45d3 + 21.610 x45e3
 + 8.146 x46a3 + 9.060 x46b3 + 9.738 x46c3
 + 13.701 x47a3 + 15.237 x47b3 + 16.377 x47c3
 + 9.998 x48a3 + 11.119 x48b3 + 11.951 x48c3
 + 19.625 x49a3 + 21.826 x49b3 + 23.459 x49c3
 + 11.479 x50a3 + 12.766 x50b3 + 13.721 x50c3
 + 19.625 x51a3 + 21.826 x51b3 + 23.459 x51c3
 + 15.552 x52a3 + 17.296 x52b3 + 18.590 x52c3
 + 6.295 x53a3 + 7.001 x53b3 + 7.525 x53c3
 + 19.475 x54c3 + 20.621 x54d3 + 21.610 x54e3
 + 17.705 x55c3 + 18.747 x55d3 + 19.645 x55e3
 + 25.672 x56c3 + 27.183 x56d3 + 28.486 x56e3
 + 19.918 x57c3 + 21.090 x57d3 + 22.101 x57e3
 + 28.328 x58c3 + 29.995 x58d3 + 31.433 x58e3
 + 23.459 x59c3 + 24.839 x59d3 + 26.030 x59e3
 + 34.066 x60a3 + 37.887 x60b3 + 40.721 x60c3
 + 23.698 x61a3 + 26.356 x61b3 + 28.328 x61c3
 + 25.550 x62a3 + 28.415 x62b3 + 30.541 x62c3
 + 23.698 x63a3 + 26.356 x63b3 + 28.328 x63c3
 + 1.481 x64a3 + 1.647 x64b3 + 1.770 x64c3
 + 34.066 x65a3 + 37.887 x65b3 + 40.721 x65c3
 + 19.625 x66a3 + 21.826 x66b3 + 23.459 x66c3
 + 28.328 x67c3 + 29.995 x67d3 + 31.433 x67e3
 + 19.918 x68c3 + 21.090 x68d3 + 22.101 x68e3
 + 12.278 x69e3 + 12.781 x69f3 + 13.253 x69g3

+ 16.377 x70c3 + 17.341 x70d3 + 18.172 x70e3
 - 13.339 x72c2 - 14.130 x72d2 - 14.814 x72e2
 - 27.512 x94c2 - 29.144 x94d2 - 30.553 x94e2
 - 2.918 x96c2 - 3.091 x96d2 - 3.240 x96e2
 - 30.430 x97c2 - 32.235 x97d2 - 33.793 x97e2
 - 18.809 x108a2 - 20.933 x108b2 - 22.510 x108c2
 - 12.191 x109a2 - 13.567 x109b2 - 14.590 x109c2 +
 14.164 x72c3 + 14.997 x72d3 + 15.716 x72e3 +
 29.213 x94c3 + 30.932 x94d3 + 32.415 x94e3 +
 3.098 x96c3 + 3.281 x96d3 + 3.438 x96e3 +
 32.311 x97c3 + 34.213 x97d3 + 35.853 x97e3 +
 19.995 x108a3 + 22.238 x108b3 + 23.902 x108c3 +
 12.960 x109a3 + 14.413 x109b3 + 15.492 x109c3 +
 16.293 x75a3 + 18.120 x75b3 + 19.475 x75c3 +
 11.066 x80c3 + 11.717 x80d3 + 12.278 x80e3 +
 23.902 x82c3 + 25.308 x82d3 + 26.521 x82e3 +
 13.330 x83a3 + 14.825 x83b3 + 15.934 x83c3 +
 18.885 x84a3 + 21.002 x84b3 + 22.574 x84c3 +
 17.705 x87c3 + 18.747 x87d3 + 19.645 x87e3 +
 13.701 x90a3 + 15.237 x90b3 + 16.377 x90c3 +
 17.705 x92c3 + 18.747 x92d3 + 19.645 x92e3 +
 21.477 x107a3 + 23.885 x107b3 + 25.672 x107c3 +
 21.477 x111a3 + 23.885 x111b3 + 25.672 x111c3 +
 12.836 x115c3 + 13.591 x115d3 + 14.243 x115e3 +
 5.894 x118e3 + 6.135 x118f3 + 6.362 x118g3 ≤ 460.0 *
 - 20.326 x1c3 - 21.531 x1d3 - 22.572 x1e3
 - 21.414 x2a3 - 23.832 x2b3 - 25.628 x2c3
 - 26.214 x3a3 - 29.174 x3b3 - 31.373 x3c3
 - 13.661 x4a3 - 15.203 x4b3 - 16.349 x4c3
 - 22.522 x5a3 - 25.065 x5b3 - 26.954 x5c3
 - 23.630 x6a3 - 26.298 x6b3 - 28.279 x6c3
 - 22.535 x7c3 - 23.872 x7d3 - 25.026 x7e3
 - 22.153 x8a3 - 24.654 x8b3 - 26.512 x8c3
 - 13.661 x9a3 - 15.203 x9b3 - 16.349 x9c3
 - 15.138 x10a3 - 16.847 x10b3 - 18.117 x10c3
 - 16.245 x11a3 - 18.080 x11b3 - 19.442 x11c3
 - 13.292 x12a3 - 14.792 x12b3 - 15.907 x12c3
 - 16.245 x13a3 - 18.080 x13b3 - 19.442 x13c3
 - 13.661 x14a3 - 15.203 x14b3 - 16.349 x14c3
 - 18.830 x15a3 - 20.956 x15b3 - 22.535 x15c3
 - 23.630 x16a3 - 26.298 x16b3 - 28.279 x16c3
 - 22.522 x17a3 - 25.065 x17b3 - 26.954 x17c3
 - 13.661 x18a3 - 15.203 x18b3 - 16.349 x18c3
 - 19.884 x19c3 - 21.063 x19d3 - 22.081 x19e3
 - 10.707 x20a3 - 11.916 x20b3 - 12.814 x20c3
 - 22.891 x21a3 - 25.476 x21b3 - 27.396 x21c3
 - 28.799 x22a3 - 32.050 x22b3 - 34.466 x22c3
 - 23.419 x23c3 - 24.808 x23d3 - 26.007 x23e3
 - 15.138 x24a3 - 16.847 x24b3 - 18.117 x24c3
 - 21.045 x25a3 - 23.421 x25b3 - 25.186 x25c3
 - 19.199 x26a3 - 21.367 x26b3 - 22.977 x26c3
 - 16.245 x27a3 - 18.080 x27b3 - 19.442 x27c3
 - 20.307 x28a3 - 22.600 x28b3 - 24.303 x28c3
 - 16.245 x29a3 - 18.080 x29b3 - 19.442 x29c3

* All coefficients should be multiplied by 10^5

- 25.628 x30c3 - 27.148 x30d3 - 28.461 x30e3
 - 8.837 x31c3 - 9.361 x31d3 - 9.814 x31e3
 - 21.210 x32c3 - 22.467 x32d3 - 23.554 x32e3
 - 32.256 x33c3 - 34.169 x33d3 - 35.821 x33e3
 - 3.093 x34c3 - 3.276 x34d3 - 3.435 x34e3
 - 29.163 x35c3 - 30.893 x35d3 - 32.386 x35e3
 - 12.923 x36a3 - 14.382 x36b3 - 15.465 x36c3
 - 19.568 x37a3 - 21.778 x37b3 - 23.419 x37c3
 - 29.163 x38c3 - 30.893 x38d3 - 32.386 x38e3
 - 9.969 x39a3 - 11.094 x39b3 - 11.930 x39c3
 - 21.414 x40a3 - 23.832 x40b3 - 25.628 x40c3
 - 9.969 x41a3 - 11.094 x41b3 - 11.930 x41c3
 - 14.140 x42c3 - 14.978 x42d3 - 15.702 x42e3
 - 25.628 x43c3 - 27.148 x43d3 - 28.461 x43e3
 - 17.675 x44c3 - 18.723 x44d3 - 19.628 x44e3
 - 19.442 x45c3 - 20.595 x45d3 - 21.591 x45e3
 - 8.123 x46a3 - 9.040 x46b3 - 9.721 x46c3
 - 13.661 x47a3 - 15.203 x47b3 - 16.349 x47c3
 - 9.969 x48a3 - 11.094 x48b3 - 11.930 x48c3
 - 19.568 x49a3 - 21.778 x49b3 - 23.419 x49c3
 - 11.446 x50a3 - 12.738 x50b3 - 13.698 x50c3
 - 19.568 x51a3 - 21.778 x51b3 - 23.419 x51c3
 - 15.507 x52a3 - 17.258 x52b3 - 18.558 x52c3
 - 6.277 x53a3 - 6.985 x53b3 - 7.512 x53c3
 - 19.442 x54c3 - 20.595 x54d3 - 21.591 x54e3
 - 17.675 x55c3 - 18.723 x55d3 - 19.628 x55e3
 - 25.628 x56c3 - 27.148 x56d3 - 28.461 x56e3
 - 19.884 x57c3 - 21.063 x57d3 - 22.081 x57e3
 - 28.279 x58c3 - 29.956 x58d3 - 31.405 x58e3
 - 23.419 x59c3 - 24.808 x59d3 - 26.007 x59e3
 - 33.968 x60a3 - 37.803 x60b3 - 40.652 x60c3
 - 23.630 x61a3 - 26.298 x61b3 - 28.279 x61c3
 - 25.476 x62a3 - 28.352 x62b3 - 30.489 x62c3
 - 23.630 x63a3 - 26.298 x63b3 - 28.279 x63c3
 - 1.477 x64a3 - 1.644 x64b3 - 1.767 x64c3
 - 33.968 x65a3 - 37.803 x65b3 - 40.652 x65c3
 - 19.568 x66a3 - 21.778 x66b3 - 23.419 x66c3
 - 28.279 x67c3 - 29.956 x67d3 - 31.405 x67e3
 - 19.884 x68c3 - 21.063 x68d3 - 22.081 x68e3
 - 12.267 x69c3 - 12.774 x69d3 - 13.250 x69e3
 - 16.349 x70c3 - 17.319 x70d3 - 18.156 x70e3
 + 21.582 x1c4 + 22.852 x1d4 + 23.948 x1e4
 + 22.765 x2a4 + 25.318 x2b4 + 27.212 x2c4
 + 27.868 x3a4 + 30.993 x3b4 + 33.312 x3c4
 + 14.523 x4a4 + 16.151 x4b4 + 17.360 x4c4
 + 23.943 x5a4 + 26.628 x5b4 + 28.620 x5c4
 + 25.120 x6a4 + 27.937 x6b4 + 30.028 x6c4
 + 23.928 x7c4 + 25.336 x7d4 + 26.551 x7e4
 + 23.550 x8a4 + 26.191 x8b4 + 28.151 x8c4
 + 14.523 x9a4 + 16.151 x9b4 + 17.360 x9c4
 + 16.093 x10a4 + 17.897 x10b4 + 19.236 x10c4
 + 17.270 x11a4 + 19.207 x11b4 + 20.644 x11c4
 + 14.130 x12a4 + 15.715 x12b4 + 16.890 x12c4
 + 17.270 x13a4 + 19.207 x13b4 + 20.644 x13c4

+ 14.523 x14a4 + 16.151 x14b4 + 17.360 x14c4
 + 20.018 x15a4 + 22.263 x15b4 + 23.928 x15c4
 + 25.120 x16a4 + 27.937 x16b4 + 30.028 x16c4
 + 23.943 x17a4 + 26.628 x17b4 + 28.620 x17c4
 + 14.523 x18a4 + 16.151 x18b4 + 17.360 x18c4
 + 21.113 x19c4 + 22.355 x19d4 + 23.427 x19e4
 + 11.383 x20a4 + 12.659 x20b4 + 13.606 x20c4
 + 24.335 x21a4 + 27.064 x21b4 + 29.089 x21c4
 + 30.615 x22a4 + 34.049 x22b4 + 36.596 x22c4
 + 24.867 x23c4 + 26.330 x23d4 + 27.592 x23e4
 + 16.093 x24a4 + 17.897 x24b4 + 19.236 x24c4
 + 22.373 x25a4 + 24.882 x25b4 + 26.743 x25c4
 + 20.410 x26a4 + 22.699 x26b4 + 24.397 x26c4
 + 17.270 x27a4 + 19.207 x27b4 + 20.644 x27c4
 + 21.588 x28a4 + 24.009 x28b4 + 25.805 x28c4
 + 17.270 x29a4 + 19.207 x29b4 + 20.644 x29c4
 + 27.212 x30c4 + 28.814 x30d4 + 30.195 x30e4
 + 9.384 x31c4 + 9.936 x31d4 + 10.412 x31e4
 + 22.521 x32c4 + 23.846 x32d4 + 24.989 x32e4
 + 34.250 x33c4 + 36.265 x33d4 + 38.004 x33e4
 + 3.284 x34c4 + 3.477 x34d4 + 3.644 x34e4
 + 30.966 x35c4 + 32.788 x35d4 + 34.360 x35e4
 + 13.738 x36a4 + 15.278 x36b4 + 16.421 x36c4
 + 20.803 x37a4 + 23.136 x37b4 + 24.867 x37c4
 + 30.966 x38c4 + 32.788 x38d4 + 34.360 x38e4
 + 10.598 x39a4 + 11.786 x39b4 + 12.668 x39c4
 + 22.765 x40a4 + 25.318 x40b4 + 27.212 x40c4
 + 10.598 x41a4 + 11.786 x41b4 + 12.668 x41c4
 + 15.014 x42c4 + 15.897 x42d4 + 16.659 x42e4
 + 27.212 x43c4 + 28.814 x43d4 + 30.195 x43e4
 + 18.767 x44c4 + 19.871 x44d4 + 20.824 x44e4
 + 20.644 x45c4 + 21.859 x45d4 + 22.906 x45e4
 + 8.635 x46a4 + 9.603 x46b4 + 10.322 x46c4
 + 14.523 x47a4 + 16.151 x47b4 + 17.360 x47c4
 + 10.598 x48a4 + 11.786 x48b4 + 12.668 x48c4
 + 20.803 x49a4 + 23.136 x49b4 + 24.867 x49c4
 + 12.168 x50a4 + 13.532 x50b4 + 14.545 x50c4
 + 20.803 x51a4 + 23.136 x51b4 + 24.867 x51c4
 + 16.485 x52a4 + 18.334 x52b4 + 19.706 x52c4
 + 6.673 x53a4 + 7.421 x53b4 + 7.976 x53c4
 + 20.644 x54c4 + 21.859 x54d4 + 22.906 x54e4
 + 18.767 x55c4 + 19.871 x55d4 + 20.824 x55e4
 + 27.212 x56c4 + 28.814 x56d4 + 30.195 x56e4
 + 21.113 x57c4 + 22.355 x57d4 + 23.427 x57e4
 + 30.028 x58c4 + 31.794 x58d4 + 33.318 x58e4
 + 24.867 x59c4 + 26.330 x59d4 + 27.592 x59e4
 + 36.110 x60a4 + 40.160 x60b4 + 43.165 x60c4
 + 25.120 x61a4 + 27.937 x61b4 + 30.028 x61c4
 + 27.083 x62a4 + 30.120 x62b4 + 32.373 x62c4
 + 25.120 x63a4 + 27.937 x63b4 + 30.028 x63c4
 + 1.570 x64a4 + 1.746 x64b4 + 1.877 x64c4
 + 36.110 x65a4 + 40.160 x65b4 + 43.165 x65c4
 + 20.803 x66a4 + 23.136 x66b4 + 24.867 x66c4
 + 30.028 x67c4 + 31.794 x67d4 + 33.318 x67e4

+ 21.113 x68c4 + 22.355 x68d4 + 23.427 x68e4
 + 13.015 x69e4 + 13.547 x69f4 + 14.048 x69g4
 + 17.360 x70c4 + 18.381 x70d4 + 19.262 x70e4
 - 14.140 x72c3 - 14.978 x72d3 - 15.702 x72e3
 - 29.163 x94c3 - 30.893 x94d3 - 32.386 x94e3
 - 3.093 x96c3 - 3.276 x96d3 - 3.435 x96e3
 - 32.256 x97c3 - 34.169 x97d3 - 35.821 x97e3
 - 19.938 x108a3 - 22.189 x108b3 - 23.861 x108c3
 - 12.923 x109a3 - 14.382 x109b3 - 15.465 x109c3
 - 16.245 x75a3 - 18.080 x75b3 - 19.442 x75c3
 - 11.047 x80c3 - 11.702 x80d3 - 12.267 x80e3
 - 23.861 x82c3 - 25.276 x82d3 - 26.498 x82e3
 - 13.292 x83a3 - 14.792 x83b3 - 15.907 x83c3
 - 18.830 x84a3 - 20.956 x84b3 - 22.535 x84c3
 - 17.675 x87c3 - 18.723 x87d3 - 19.628 x87e3
 - 13.661 x90a3 - 15.203 x90b3 - 16.349 x90c3
 - 17.675 x92c3 - 18.723 x92d3 - 19.628 x92e3
 - 21.414 x107a3 - 23.832 x107b3 - 25.628 x107c3
 - 21.414 x111a3 - 23.832 x111b3 - 25.628 x111c3
 - 12.814 x115c3 - 13.574 x115d3 - 14.230 x115e3
 - 5.888 x118e3 - 6.131 x118f3 - 6.360 x118g3+
 15.014 x72c4 + 15.897 x72d4 + 16.659 x72e4 +
 30.966 x94c4 + 32.788 x94d4 + 34.360 x94e4 +
 3.284 x96c4 + 3.477 x96d4 + 3.644 x96e4 +
 34.250 x97c4 + 36.265 x97d4 + 38.004 x97e4 +
 21.195 x108a4 + 23.572 x108b4 + 25.336 x108c4 +
 13.738 x109a4 + 15.278 x109b4 + 16.421 x109c4 +
 17.270 x75a4 + 19.207 x75b4 + 20.644 x75c4 +
 11.730 x80c4 + 12.420 x80d4 + 13.015 x80e4 +
 25.336 x82c4 + 26.826 x82d4 + 28.112 x82e4 +
 14.130 x83a4 + 15.715 x83b4 + 16.890 x83c4 +
 20.018 x84a4 + 22.263 x84b4 + 23.928 x84c4 +
 18.767 x87c4 + 19.871 x87d4 + 20.824 x87e4 +
 14.523 x90a4 + 16.151 x90b4 + 17.360 x90c4 +
 18.767 x92c4 + 19.871 x92d4 + 20.824 x92e4 +
 22.765 x107a4 + 25.318 x107b4 + 27.212 x107c4 +
 22.765 x110a4 + 25.318 x110b4 + 27.212 x110c4 +
 13.606 x111a4 + 14.407 x111b4 + 15.097 x111c4 +
 6.247 x115c4 + 6.503 x115d4 + 6.743 x115e4 +
 5.630 x118e4 + 5.961 x118f4 + 6.247 x118g4 +
 20.410 x73c4 + 22.699 x73d4 + 24.397 x73e4 +
 6.569 x76a4 + 6.955 x76b4 + 7.288 x76c4 +
 16.093 x79c4 + 17.897 x79d4 + 19.236 x79e4 +
 20.644 x86a4 + 21.859 x86b4 + 22.906 x86c4 +
 15.483 x88c4 + 16.394 x88d4 + 17.180 x88e4 +
 27.212 x93c4 + 28.814 x93d4 + 30.195 x93e4 +
 22.521 x95c4 + 23.846 x95d4 + 24.989 x95e4 +
 20.803 x100c4 + 23.136 x100d4 + 24.867 x100e4 +
 29.438 x105a4 + 32.739 x105b4 + 35.189 x105c4 +
 6.099 x114c4 + 6.458 x114d4 + 6.768 x114e4 +
 13.015 x116e4 + 13.547 x116f4 + 14.048 x116g4 +
 15.952 x117c4 + 16.891 x117d4 + 17.700 x117e4 $\leq$ 600.0 *

* All coefficients should be multiplied by 10^5

- 21.545 x1c4 - 22.823 x1d4 - 23.926 x1e4
 - 22.699 x2a4 - 25.262 x2b4 - 27.166 x2c4
 - 27.787 x3a4 - 30.924 x3b4 - 33.255 x3c4
 - 14.481 x4a4 - 16.116 x4b4 - 17.330 x4c4
 - 23.873 x5a4 - 26.569 x5b4 - 28.571 x5c4
 - 25.048 x6a4 - 27.875 x6b4 - 29.976 x6c4
 - 23.887 x7c4 - 25.304 x7d4 - 26.527 x7e4
 - 23.482 x8a4 - 26.133 x8b4 - 28.103 x8c4
 - 14.481 x9a4 - 16.116 x9b4 - 17.330 x9c4
 - 16.046 x10a4 - 17.858 x10b4 - 19.204 x10c4
 - 17.220 x11a4 - 19.164 x11b4 - 20.609 x11c4
 - 14.089 x12a4 - 15.680 x12b4 - 16.862 x12c4
 - 17.220 x13a4 - 19.164 x13b4 - 20.609 x13c4
 - 14.481 x14a4 - 16.116 x14b4 - 17.330 x14c4
 - 19.960 x15a4 - 22.213 x15b4 - 23.887 x15c4
 - 25.048 x16a4 - 27.875 x16b4 - 29.976 x16c4
 - 23.873 x17a4 - 26.569 x17b4 - 28.571 x17c4
 - 14.481 x18a4 - 16.116 x18b4 - 17.330 x18c4
 - 21.077 x19c4 - 22.327 x19d4 - 23.406 x19e4
 - 11.350 x20a4 - 12.631 x20b4 - 13.583 x20c4
 - 24.265 x21a4 - 27.004 x21b4 - 29.039 x21c4
 - 20.527 x22a4 - 33.973 x22b4 - 36.534 x22c4
 - 24.824 x23c4 - 26.296 x23d4 - 27.567 x23e4
 - 16.046 x24a4 - 17.858 x24b4 - 19.204 x24c4
 - 22.308 x25a4 - 24.827 x25b4 - 26.698 x25c4
 - 20.351 x26a4 - 22.649 x26b4 - 24.356 x26c4
 - 17.220 x27a4 - 19.164 x27b4 - 20.609 x27c4
 - 21.525 x28a4 - 23.955 x28b4 - 25.761 x28c4
 - 17.220 x29a4 - 19.164 x29b4 - 20.609 x29c4
 - 27.166 x30c4 - 28.777 x30d4 - 30.168 x30e4
 - 9.368 x31c4 - 9.923 x31d4 - 10.403 x31e4
 - 22.482 x32c4 - 23.815 x32d4 - 24.967 x32e4
 - 34.192 x33c4 - 36.219 x33d4 - 37.970 x33e4
 - 3.279 x34c4 - 3.473 x34d4 - 3.641 x34e4
 - 30.913 x35c4 - 32.746 x35d4 - 34.329 x35e4
 - 13.698 x36a4 - 15.244 x36b4 - 16.393 x36c4
 - 20.742 x37a4 - 23.084 x37b4 - 24.824 x37c4
 - 30.913 x38c4 - 32.746 x38d4 - 34.329 x38e4
 - 10.567 x39a4 - 11.760 x39b4 - 12.646 x39c4
 - 22.699 x40a4 - 25.262 x40b4 - 27.166 x40c4
 - 10.567 x41a4 - 11.760 x41b4 - 12.646 x41c4
 - 14.988 x42c4 - 15.877 x42d4 - 16.644 x42e4
 - 27.166 x43c4 - 28.777 x43d4 - 30.168 x43e4
 - 18.735 x44c4 - 19.846 x44d4 - 20.806 x44e4
 - 20.609 x45c4 - 21.831 x45d4 - 22.886 x45e4
 - 8.610 x46a4 - 9.582 x46b4 - 10.304 x46c4
 - 14.481 x47a4 - 16.116 x47b4 - 17.330 x47c4
 - 10.567 x48a4 - 11.760 x48b4 - 12.646 x48c4
 - 20.742 x49a4 - 23.084 x49b4 - 24.824 x49c4
 - 12.132 x50a4 - 13.502 x50b4 - 14.520 x50c4
 - 20.742 x51a4 - 23.084 x51b4 - 24.824 x51c4
 - 16.437 x52a4 - 18.293 x52b4 - 19.672 x52c4
 - 6.653 x53a4 - 7.404 x53b4 - 7.962 x53c4
 - 20.609 x54c4 - 21.831 x54d4 - 22.886 x54e4

- 18.735 x55c4 - 19.846 x55d4 - 20.806 x55e4
 - 27.166 x56c4 - 28.777 x56d4 - 30.168 x56e4
 - 21.077 x57c4 - 22.327 x57d4 - 23.406 x57e4
 - 29.976 x58c4 - 31.754 x58d4 - 33.289 x58e4
 - 24.824 x59c4 - 26.296 x59d4 - 27.567 x59e4
 - 36.006 x60a4 - 40.071 x60b4 - 43.091 x60c4
 - 25.048 x61a4 - 27.875 x61b4 - 29.976 x61c4
 - 27.004 x62a4 - 30.053 x62b4 - 32.318 x62c4
 - 25.048 x63a4 - 27.875 x63b4 - 29.976 x63c4
 - 1.565 x64a4 - 1.742 x64b4 - 1.874 x64c4
 - 36.006 x65a4 - 40.071 x65b4 - 43.091 x65c4
 - 20.742 x66a4 - 23.084 x66b4 - 24.824 x66c4
 - 29.976 x67c4 - 31.754 x67d4 - 33.289 x67e4
 - 21.077 x68c4 - 22.327 x68d4 - 23.406 x68e4
 - 13.004 x69e4 - 13.540 x69f4 - 14.045 x69g4
 - 17.330 x70c4 - 18.358 x70d4 - 19.245 x70e4
 + 22.877 x1c5 + 24.223 x1d5 + 25.385 x1e5
 + 24.131 x2a5 + 26.837 x2b5 + 28.845 x2c5
 + 29.540 x3a5 + 32.853 x3b5 + 35.311 x3c5
 + 15.394 x4a5 + 17.120 x4b5 + 18.401 x4c5
 + 25.379 x5a5 + 28.225 x5b5 + 30.337 x5c5
 + 26.627 x6a5 + 29.614 x6b5 + 31.829 x6c5
 + 25.364 x7c5 + 26.856 x7d5 + 28.144 x7e5
 + 24.963 x8a5 + 27.763 x8b5 + 29.840 x8c5
 + 15.394 x9a5 + 17.120 x9b5 + 18.401 x9c5
 + 17.058 x10a5 + 18.971 x10b5 + 20.391 x10c5
 + 18.306 x11a5 + 20.359 x11b5 + 21.883 x11c5
 + 14.978 x12a5 + 16.658 x12b5 + 17.904 x12c5
 + 18.306 x13a5 + 20.359 x13b5 + 21.883 x13c5
 + 15.394 x14a5 + 17.120 x14b5 + 18.401 x14c5
 + 21.219 x15a5 + 23.598 x15b5 + 25.364 x15c5
 + 26.627 x16a5 + 29.614 x16b5 + 31.829 x16c5
 + 25.379 x17a5 + 28.225 x17b5 + 30.337 x17c5
 + 15.394 x18a5 + 17.120 x18b5 + 18.401 x18c5
 + 22.380 x19c5 + 23.697 x19d5 + 24.833 x19e5
 + 12.066 x20a5 + 13.419 x20b5 + 14.423 x20c5
 + 25.795 x21a5 + 28.688 x21b5 + 30.835 x21c5
 + 32.452 x22a5 + 36.091 x22b5 + 38.792 x22c5
 + 26.359 x23c5 + 27.909 x23d5 + 29.247 x23e5
 + 17.058 x24a5 + 18.971 x24b5 + 20.391 x24c5
 + 23.715 x25a5 + 26.375 x25b5 + 28.348 x25c5
 + 21.635 x26a5 + 24.061 x26b5 + 25.861 x26c5
 + 18.306 x27a5 + 20.359 x27b5 + 21.883 x27c5
 + 22.883 x28a5 + 25.449 x28b5 + 27.353 x28c5
 + 18.306 x29a5 + 20.359 x29b5 + 21.883 x29c5
 + 28.845 x30c5 + 30.542 x30d5 + 32.007 x30e5
 + 9.947 x31c5 + 10.532 x31d5 + 11.037 x31e5
 + 23.872 x32c5 + 25.276 x32d5 + 26.488 x32e5
 + 36.305 x33c5 + 38.441 x33d5 + 40.284 x33e5
 + 3.481 x34c5 + 3.686 x34d5 + 3.863 x34e5
 + 32.824 x35c5 + 34.755 x35d5 + 36.421 x35e5
 + 14.562 x36a5 + 16.195 x36b5 + 17.407 x36c5
 + 22.051 x37a5 + 24.524 x37b5 + 26.359 x37c5
 + 32.824 x38c5 + 34.755 x38d5 + 36.421 x38e5

+ 11.233 x39a5 + 12.493 x39b5 + 13.428 x39c5
 + 24.131 x40a5 + 26.837 x40b5 + 28.845 x40c5
 + 11.233 x41a5 + 12.493 x41b5 + 13.428 x41c5
 + 15.915 x42c5 + 16.851 x42d5 + 17.659 x42e5
 + 28.845 x43c5 + 30.542 x43d5 + 32.007 x43e5
 + 19.893 x44c5 + 21.064 x44d5 + 22.073 x44e5
 + 21.883 x45c5 + 23.170 x45d5 + 24.281 x45e5
 + 9.153 x46a5 + 10.180 x46b5 + 10.941 x46c5
 + 15.394 x47a5 + 17.120 x47b5 + 18.401 x47c5
 + 11.233 x48a5 + 12.493 x48b5 + 13.428 x48c5
 + 22.051 x49a5 + 24.524 x49b5 + 26.359 x49c5
 + 12.898 x50a5 + 14.344 x50b5 + 15.417 x50c5
 + 22.051 x51a5 + 24.524 x51b5 + 26.359 x51c5
 + 17.474 x52a5 + 19.434 x52b5 + 20.888 x52c5
 + 7.073 x53a5 + 7.866 x53b5 + 8.455 x53c5
 + 21.883 x54c5 + 23.170 x54d5 + 24.281 x54e5
 + 19.893 x55c5 + 21.064 x55d5 + 22.073 x55e5
 + 28.845 x56c5 + 30.542 x56d5 + 32.007 x56e5
 + 22.380 x57c5 + 23.697 x57d5 + 24.833 x57e5
 + 31.829 x58c5 + 33.702 x58d5 + 35.318 x58e5
 + 26.359 x59c5 + 27.909 x59d5 + 29.247 x59e5
 + 38.277 x60a5 + 42.569 x60b5 + 45.754 x60c5
 + 26.627 x61a5 + 29.614 x61b5 + 31.829 x61c5
 + 28.708 x62a5 + 31.927 x62b5 + 34.316 x62c5
 + 26.627 x63a5 + 29.614 x63b5 + 31.829 x63c5
 + 1.664 x64a5 + 1.851 x64b5 + 1.989 x64c5
 + 38.277 x65a5 + 42.569 x65b5 + 45.754 x65c5
 + 22.051 x66a5 + 24.524 x66b5 + 26.359 x66c5
 + 31.829 x67c5 + 33.702 x67d5 + 35.318 x67e5
 + 22.380 x68c5 + 23.697 x68d5 + 24.833 x68e5
 + 13.796 x69e5 + 14.360 x69f5 + 14.891 x69g5
 + 18.401 x70c5 + 19.484 x70d5 + 20.418 x70e5
 - 14.988 x72c4 - 15.877 x72d4 - 16.644 x72e4
 - 30.913 x94c4 - 32.746 x94d4 - 34.329 x94e4
 - 3.279 x96c4 - 3.473 x96d4 - 3.641 x96e4
 - 34.192 x97c4 - 36.219 x97d4 - 37.970 x97e4
 - 21.134 x108a4 - 23.520 x108b4 - 25.292 x108c4
 - 13.698 x109a4 - 15.244 x109b4 - 16.393 x109c4
 - 17.220 x75a4 - 19.164 x75b4 - 20.609 x75c4
 - 11.709 x80c4 - 12.404 x80d4 - 13.004 x80e4
 - 25.292 x82c4 - 26.792 x82d4 - 28.088 x82e4
 - 14.089 x83a4 - 15.680 x83b4 - 16.862 x83c4
 - 19.960 x84a4 - 22.213 x84b4 - 23.887 x84c4
 - 18.735 x87c4 - 19.846 x87d4 - 20.806 x87e4
 - 14.481 x90a4 - 16.116 x90b4 - 17.330 x90c4
 - 18.735 x92c4 - 19.846 x92d4 - 20.806 x92e4
 - 22.699 x107a4 - 25.262 x107b4 - 27.166 x107c4
 - 22.699 x110a4 - 25.262 x110b4 - 27.166 x110c4
 - 13.583 x111a4 - 14.388 x111b4 - 15.084 x111c4
 - 6.242 x115c4 - 6.499 x115d4 - 6.742 x115e4
 - 5.621 x118e4 - 5.954 x118f4 - 6.242 x118g4
 - 20.351 x73c4 - 22.649 x73d4 - 24.356 x73e4
 - 6.557 x76a4 - 6.946 x76b4 - 7.282 x76c4
 - 16.046 x79c4 - 17.858 x79d4 - 19.204 x79e4

- 20.609 x86a4 - 21.831 x86b4 - 22.886 x86c4
 - 15.457 x88c4 - 16.373 x88d4 - 17.165 x88e4
 - 27.166 x93c4 - 28.777 x93d4 - 30.168 x93e4
 - 22.482 x95c4 - 23.815 x95d4 - 24.967 x95e4
 - 20.742 x100c4 - 23.084 x100d4 - 24.824 x100e4
 - 29.353 x105a4 - 32.667 x105b4 - 35.128 x105c4
 - 6.089 x114c4 - 6.450 x114d4 - 6.762 x114e4
 - 13.004 x116e4 - 13.540 x116f4 - 14.045 x116g4
 - 15.925 x117c4 - 16.869 x117d4 - 17.685 x117e4 +
 15.915 x72c5 + 16.851 x72d5 + 17.659 x72e5 +
 32.824 x94c5 + 34.755 x94d5 + 36.421 x94e5 +
 3.481 x96c5 + 3.686 x96d5 + 3.863 x96e5 +
 36.305 x97c5 + 38.441 x97d5 + 40.284 x97e5 +
 22.467 x108a5 + 24.986 x108b5 + 26.856 x108c5 +
 14.562 x109a5 + 16.195 x109b5 + 17.407 x109c5 +
 18.306 x75a5 + 20.359 x75b5 + 21.883 x75c5 +
 12.433 x80c5 + 13.165 x80d5 + 13.796 x80e5 +
 26.856 x82c5 + 28.436 x82d5 + 29.799 x82e5 +
 14.978 x83a5 + 16.658 x83b5 + 17.904 x83c5 +
 21.219 x84a5 + 23.598 x84b5 + 25.364 x84c5 +
 19.893 x87c5 + 21.064 x87d5 + 22.073 x87e5 +
 15.394 x90a4 + 17.120 x90b5 + 18.401 x90c5 +
 19.893 x92c5 + 21.064 x92d5 + 22.073 x92e5 +
 24.131 x107a5 + 26.837 x107b5 + 28.845 x107c5 +
 24.131 x110a5 + 26.837 x110b5 + 28.845 x110c5 +
 14.423 x111a5 + 15.271 x111b5 + 16.003 x111c5 +
 6.622 x115c5 + 6.893 x115d5 + 7.148 x115e5 +
 5.968 x118e5 + 6.319 x118f5 + 6.622 x118g5 +
 21.635 x73c5 + 24.061 x73d5 + 25.861 x73e5 +
 6.963 x76a5 + 7.372 x76b5 + 7.726 x76c5 +
 17.058 x79c5 + 18.971 x79d5 + 20.391 x79e5 +
 21.883 x86a5 + 23.170 x86b5 + 24.281 x86c5 +
 16.412 x88c5 + 17.378 x88d5 + 18.211 x88e5 +
 28.845 x93c5 + 30.542 x93d5 + 32.007 x93e5 +
 23.872 x95c5 + 25.276 x95d5 + 26.488 x95e5 +
 22.051 x100c5 + 24.524 x100d5 + 26.359 x100e5 +
 31.204 x105a5 + 34.703 x105b5 + 37.300 x105c5 +
 6.465 x114c5 + 6.846 x114d5 + 7.174 x114e5 +
 13.796 x116e5 + 14.360 x116f5 + 14.891 x116g5 +
 16.909 x117c5 + 17.904 x117d5 + 18.762 x117e5 +
 7.957 x71c5 + 8.425 x71d5 + 8.829 x71e5 +
 22.883 x74a5 + 25.449 x74b5 + 27.353 x74c5 +
 8.455 x77c5 + 8.952 x77d5 + 9.381 x77e5 +
 13.730 x78a5 + 15.269 x78b5 + 16.412 x78c5 +
 6.963 x81c5 + 7.372 x81d5 + 7.726 x81e5 +
 15.394 x85a5 + 17.120 x85b5 + 18.401 x85c5 +
 14.978 x89a5 + 16.658 x89b5 + 17.904 x89c5 +
 17.058 x91a5 + 18.971 x91b5 + 20.391 x91c5 +
 18.401 x98c5 + 19.484 x98d5 + 20.418 x98e5 +
 32.824 x99c5 + 34.755 x99d5 + 36.421 x99e5 +
 3.481 x101c5 + 3.686 x101d5 + 3.863 x101e5 +
 36.305 x102c5 + 38.441 x102d5 + 40.284 x102e5 +
 18.401 x103a5 + 19.484 x103b5 + 20.418 x103c5 +
 26.211 x104a5 + 29.151 x104b5 + 31.332 x104c5 +
 24.963 x106a5 + 27.763 x106b5 + 29.840 x106c5 +
 13.796 x112e5 + 14.360 x112f5 + 14.891 x112g5 +
 15.915 x113c5 + 16.851 x113d5 + 17.659 x113e5 $\leq$ 750.0 *

* All coefficients should be multiplied by 10^5

```

x1c1 + x1d1 + x1e1 < 1
x1c2 + x1d2 + x1e2 < 1
x1c3 + x1d3 + x1e3 < 1
x1c4 + x1d4 + x1e4 < 1
x1c5 + x1d5 + x1e5 < 1
x2a1 + x2b1 + x2c1 < 1
x2a2 + x2b2 + x2c2 < 1
x2a3 + x2b3 + x2c3 < 1
x2a4 + x2b4 + x2c4 < 1
x2a5 + x2b5 + x2c5 < 1
x3a1 + x3b1 + x3c1 < 1
x3a2 + x3b2 + x3c2 < 1
x3a3 + x3b3 + x3c3 < 1
x3a4 + x3b4 + x3c4 < 1
x3a5 + x3b5 + x3c5 < 1
x4a1 + x4b1 + x4c1 < 1
x4a2 + x4b2 + x4c2 < 1
x4a3 + x4b3 + x4c3 < 1
x4a4 + x4b4 + x4c4 < 1
x4a5 + x4b5 + x4c5 < 1
x5a1 + x5b1 + x5c1 < 1
x5a2 + x5b2 + x5c2 < 1
x5a3 + x5b3 + x5c3 < 1
x5a4 + x5b4 + x5c4 < 1
x5a5 + x5b5 + x5c5 < 1
x6a1 + x6b1 + x6c1 < 1
x6a2 + x6b2 + x6c2 < 1
x6a3 + x6b3 + x6c3 < 1
x6a4 + x6b4 + x6c4 < 1
x6a5 + x6b5 + x6c5 < 1
x7c1 + x7d1 + x7e1 < 1
x7c2 + x7d2 + x7e2 < 1
x7c3 + x7d3 + x7e3 < 1
x7c4 + x7d4 + x7e4 < 1
x7c5 + x7d5 + x7e5 < 1
x8a1 + x8b1 + x8c1 < 1
x8a2 + x8b2 + x8c2 < 1
x8a3 + x8b3 + x8c3 < 1
x8a4 + x8b4 + x8c4 < 1
x8a5 + x8b5 + x8c5 < 1
x9a1 + x9b1 + x9c1 < 1
x9a2 + x9b2 + x9c2 < 1
x9a3 + x9b3 + x9c3 < 1
x9a4 + x9b4 + x9c4 < 1
x9a5 + x9b5 + x9c5 < 1
x10a1 + x10b1 + x10c1 < 1
x10a2 + x10b2 + x10c2 < 1
x10a3 + x10b3 + x10c3 < 1
x10a4 + x10b4 + x10c4 < 1
x10a5 + x10b5 + x10c5 < 1
x11a1 + x11b1 + x11c1 < 1
x11a2 + x11b2 + x11c2 < 1
x11a3 + x11b3 + x11c3 < 1
x11a4 + x11b4 + x11c4 < 1
x11a5 + x11b5 + x11c5 < 1
x12a1 + x12b1 + x12c1 < 1
x12a2 + x12b2 + x12c2 < 1
x12a3 + x12b3 + x12c3 < 1
x12a4 + x12b4 + x12c4 < 1
x12a5 + x12b5 + x12c5 < 1
x13a1 + x13b1 + x13c1 < 1
x13a2 + x13b2 + x13c2 < 1
x13a3 + x13b3 + x13c3 < 1
x13a4 + x13b4 + x13c4 < 1
x13a5 + x13b5 + x13c5 < 1
x14a1 + x14b1 + x14c1 < 1
x14a2 + x14b2 + x14c2 < 1
x14a3 + x14b3 + x14c3 < 1
x14a4 + x14b4 + x14c4 < 1
x14a5 + x14b5 + x14c5 < 1
x15a1 + x15b1 + x15c1 < 1
x15a2 + x15b2 + x15c2 < 1
x15a3 + x15b3 + x15c3 < 1
x15a4 + x15b4 + x15c4 < 1
x15a5 + x15b5 + x15c5 < 1
x16a1 + x16b1 + x16c1 < 1
x16a2 + x16b2 + x16c2 < 1
x16a3 + x16b3 + x16c3 < 1
x16a4 + x16b4 + x16c4 < 1
x16a5 + x16b5 + x16c5 < 1
x17a1 + x17b1 + x17c1 < 1
x17a2 + x17b2 + x17c2 < 1
x17a3 + x17b3 + x17c3 < 1
x17a4 + x17b4 + x17c4 < 1
x17a5 + x17b5 + x17c5 < 1
x18a1 + x18b1 + x18c1 < 1
x18a2 + x18b2 + x18c2 < 1
x18a3 + x18b3 + x18c3 < 1
x18a4 + x18b4 + x18c4 < 1
x18a5 + x18b5 + x18c5 < 1
x19c1 + x19d1 + x19e1 < 1
x19c2 + x19d2 + x19e2 < 1
x19c3 + x19d3 + x19e3 < 1
x19c4 + x19d4 + x19e4 < 1
x19c5 + x19d5 + x19e5 < 1
x20a1 + x20b1 + x20c1 < 1
x20a2 + x20b2 + x20c2 < 1
x20a3 + x20b3 + x20c3 < 1
x20a4 + x20b4 + x20c4 < 1
x20a5 + x20b5 + x20c5 < 1
x21a1 + x21b1 + x21c1 < 1
x21a2 + x21b2 + x21c2 < 1
x21a3 + x21b3 + x21c3 < 1
x21a4 + x21b4 + x21c4 < 1
x21a5 + x21b5 + x21c5 < 1
x22a1 + x22b1 + x22c1 < 1
x22a2 + x22b2 + x22c2 < 1
x22a3 + x22b3 + x22c3 < 1
x22a4 + x22b4 + x22c4 < 1

```

Note: < - implies less than or equal to (i.e. $\leq$)

x22a5 + x22b5 + x22c5 < 1	x33c5 + x33d5 + x33e5 < 1
x23c1 + x23d1 + x23e1 < 1	x34c1 + x34d1 + x34e1 < 1
x23c2 + x23d2 + x23e2 < 1	x34c2 + x34d2 + x34e2 < 1
x23c3 + x23d3 + x23e3 < 1	x34c3 + x34d3 + x34e3 < 1
x23c4 + x23d4 + x23e4 < 1	x34c4 + x34d4 + x34e4 < 1
x23c5 + x23d5 + x23e5 < 1	x34c5 + x34d5 + x34e5 < 1
x24a1 + x24b1 + x24c1 < 1	x35c1 + x35d1 + x35e1 < 1
x24a2 + x24b2 + x24c2 < 1	x35c2 + x35d2 + x35e2 < 1
x24a3 + x24b3 + x24c3 < 1	x35c3 + x35d3 + x35e3 < 1
x24a4 + x24b4 + x24c4 < 1	x35c4 + x35d4 + x35e4 < 1
x24a5 + x24b5 + x24c5 < 1	x35c5 + x35d5 + x35e5 < 1
x25a1 + x25b1 + x25c1 < 1	x36a1 + x36b1 + x36c1 < 1
x25a2 + x25b2 + x25c2 < 1	x36a2 + x36b2 + x36c2 < 1
x25a3 + x25b3 + x25c3 < 1	x36a3 + x36b3 + x36c3 < 1
x25a4 + x25b4 + x25c4 < 1	x36a4 + x36b4 + x36c4 < 1
x25a5 + x25b5 + x25c5 < 1	x36a5 + x36b5 + x36c5 < 1
x26a1 + x26b1 + x26c1 < 1	x37a1 + x37b1 + x37c1 < 1
x26a2 + x26b2 + x26c2 < 1	x37a2 + x37b2 + x37c2 < 1
x26a3 + x26b3 + x26c3 < 1	x37a3 + x37b3 + x37c3 < 1
x26a4 + x26b4 + x26c4 < 1	x37a4 + x37b4 + x37c4 < 1
x26a5 + x26b5 + x26c5 < 1	x37a5 + x37b5 + x37c5 < 1
x27a1 + x27b1 + x27c1 < 1	x38c1 + x38d1 + x38e1 < 1
x27a2 + x27b2 + x27c2 < 1	x38c2 + x38d2 + x38e2 < 1
x27a3 + x27b3 + x27c3 < 1	x38c3 + x38d3 + x38e3 < 1
x27a4 + x27b4 + x27c4 < 1	x38c4 + x38d4 + x38e4 < 1
x27a5 + x27b5 + x27c5 < 1	x38c5 + x38d5 + x38e5 < 1
x28a1 + x28b1 + x28c1 < 1	x39a1 + x39b1 + x39c1 < 1
x28a2 + x28b2 + x28c2 < 1	x39a2 + x39b2 + x39c2 < 1
x28a3 + x28b3 + x28c3 < 1	x39a3 + x39b3 + x39c3 < 1
x28a4 + x28b4 + x28c4 < 1	x39a4 + x39b4 + x39c4 < 1
x28a5 + x28b5 + x28c5 < 1	x39a5 + x39b5 + x39c5 < 1
x29a1 + x29b1 + x29c1 < 1	x40a1 + x40b1 + x40c1 < 1
x29a2 + x29b2 + x29c2 < 1	x40a2 + x40b2 + x40c2 < 1
x29a3 + x29b3 + x29c3 < 1	x40a3 + x40b3 + x40c3 < 1
x29a4 + x29b4 + x29c4 < 1	x40a4 + x40b4 + x40c4 < 1
x29a5 + x29b5 + x29c5 < 1	x40a5 + x40b5 + x40c5 < 1
x30c1 + x30d1 + x30e1 < 1	x41a1 + x41b1 + x41c1 < 1
x30c2 + x30d2 + x30e2 < 1	x41a2 + x41b2 + x41c2 < 1
x30c3 + x30d3 + x30e3 < 1	x41a3 + x41b3 + x41c3 < 1
x30c4 + x30d4 + x30e4 < 1	x41a4 + x41b4 + x41c4 < 1
x30c5 + x30d5 + x30e5 < 1	x41a5 + x41b5 + x41c5 < 1
x31c1 + x31d1 + x31e1 < 1	x42c1 + x42d1 + x42e1 < 1
x31c2 + x31d2 + x31e2 < 1	x42c2 + x42d2 + x42e2 < 1
x31c3 + x31d3 + x31e3 < 1	x42c3 + x42d3 + x42e3 < 1
x31c4 + x31d4 + x31e4 < 1	x42c4 + x42d4 + x42e4 < 1
x31c5 + x31d5 + x31e5 < 1	x42c5 + x42d5 + x42e5 < 1
x32c1 + x32d1 + x32e1 < 1	x43c1 + x43d1 + x43e1 < 1
x32c2 + x32d2 + x32e2 < 1	x43c2 + x43d2 + x43e2 < 1
x32c3 + x32d3 + x32e3 < 1	x43c3 + x43d3 + x43e3 < 1
x32c4 + x32d4 + x32e4 < 1	x43c4 + x43d4 + x43e4 < 1
x32c5 + x32d5 + x32e5 < 1	x43c5 + x43d5 + x43e5 < 1
x33c1 + x33d1 + x33e1 < 1	x44c1 + x44d1 + x44e1 < 1
x33c2 + x33d2 + x33e2 < 1	x44c2 + x44d2 + x44e2 < 1
x33c3 + x33d3 + x33e3 < 1	x44c3 + x44d3 + x44e3 < 1
x33c4 + x33d4 + x33e4 < 1	x44c4 + x44d4 + x44e4 < 1

Note: < - implies less than or equal to (i.e. $\leq$)

x44c5 + x44d5 + x44e5 < 1	x55c5 + x55d5 + x55e5 < 1
x45c1 + x45d1 + x45e1 < 1	x56c1 + x56d1 + x56e1 < 1
x45c2 + x45d2 + x45e2 < 1	x56c2 + x56d2 + x56e2 < 1
x45c3 + x45d3 + x45e3 < 1	x56c3 + x56d3 + x56e3 < 1
x45c4 + x45d4 + x45e4 < 1	x56c4 + x56d4 + x56e4 < 1
x45c5 + x45d5 + x45e5 < 1	x56c5 + x56d5 + x56e5 < 1
x46a1 + x46b1 + x46c1 < 1	x57c1 + x57d1 + x57e1 < 1
x46a2 + x46b2 + x46c2 < 1	x57c2 + x57d2 + x57e2 < 1
x46a3 + x46b3 + x46c3 < 1	x57c3 + x57d3 + x57e3 < 1
x46a4 + x46b4 + x46c4 < 1	x57c4 + x57d4 + x57e4 < 1
x46a5 + x46b5 + x46c5 < 1	x57c5 + x57d5 + x57e5 < 1
x47a1 + x47b1 + x47c1 < 1	x58c1 + x58d1 + x58e1 < 1
x47a2 + x47b2 + x47c2 < 1	x58c2 + x58d2 + x58e2 < 1
x47a3 + x47b3 + x47c3 < 1	x58c3 + x58d3 + x58e3 < 1
x47a4 + x47b4 + x47c4 < 1	x58c4 + x58d4 + x58e4 < 1
x47a5 + x47b5 + x47c5 < 1	x58c5 + x58d5 + x58e5 < 1
x48a1 + x48b1 + x48c1 < 1	x59c1 + x59d1 + x59e1 < 1
x48a2 + x48b2 + x48c2 < 1	x59c2 + x59d2 + x59e2 < 1
x48a3 + x48b3 + x48c3 < 1	x59c3 + x59d3 + x59e3 < 1
x48a4 + x48b4 + x48c4 < 1	x59c4 + x59d4 + x59e4 < 1
x48a5 + x48b5 + x48c5 < 1	x59c5 + x59d5 + x59e5 < 1
x49a1 + x49b1 + x49c1 < 1	x60a1 + x60b1 + x60c1 < 1
x49a2 + x49b2 + x49c2 < 1	x60a2 + x60b2 + x60c2 < 1
x49a3 + x49b3 + x49c3 < 1	x60a3 + x60b3 + x60c3 < 1
x49a4 + x49b4 + x49c4 < 1	x60a4 + x60b4 + x60c4 < 1
x49a5 + x49b5 + x49c5 < 1	x60a5 + x60b5 + x60c5 < 1
x50a1 + x50b1 + x50c1 < 1	x61a1 + x61b1 + x61c1 < 1
x50a2 + x50b2 + x50c2 < 1	x61a2 + x61b2 + x61c2 < 1
x50a3 + x50b3 + x50c3 < 1	x61a3 + x61b3 + x61c3 < 1
x50a4 + x50b4 + x50c4 < 1	x61a4 + x61b4 + x61c4 < 1
x50a5 + x50b5 + x50c5 < 1	x61a5 + x61b5 + x61c5 < 1
x51a1 + x51b1 + x51c1 < 1	x62a1 + x62b1 + x62c1 < 1
x51a2 + x51b2 + x51c2 < 1	x62a2 + x62b2 + x62c2 < 1
x51a3 + x51b3 + x51c3 < 1	x62a3 + x62b3 + x62c3 < 1
x51a4 + x51b4 + x51c4 < 1	x62a4 + x62b4 + x62c4 < 1
x51a5 + x51b5 + x51c5 < 1	x62a5 + x62b5 + x62c5 < 1
x52a1 + x52b1 + x52c1 < 1	x63a1 + x63b1 + x63c1 < 1
x52a2 + x52b2 + x52c2 < 1	x63a2 + x63b2 + x63c2 < 1
x52a3 + x52b3 + x52c3 < 1	x63a3 + x63b3 + x63c3 < 1
x52a4 + x52b4 + x52c4 < 1	x63a4 + x63b4 + x63c4 < 1
x52a5 + x52b5 + x52c5 < 1	x63a5 + x63b5 + x63c5 < 1
x53a1 + x53b1 + x53c1 < 1	x64a1 + x64b1 + x64c1 < 1
x53a2 + x53b2 + x53c2 < 1	x64a2 + x64b2 + x64c2 < 1
x53a3 + x53b3 + x53c3 < 1	x64a3 + x64b3 + x64c3 < 1
x53a4 + x53b4 + x53c4 < 1	x64a4 + x64b4 + x64c4 < 1
x53a5 + x53b5 + x53c5 < 1	x64a5 + x64b5 + x64c5 < 1
x54c1 + x54d1 + x54e1 < 1	x65a1 + x65b1 + x65c1 < 1
x54c2 + x54d2 + x54e2 < 1	x65a2 + x65b2 + x65c2 < 1
x54c3 + x54d3 + x54e3 < 1	x65a3 + x65b3 + x65c3 < 1
x54c4 + x54d4 + x54e4 < 1	x65a4 + x65b4 + x65c4 < 1
x54c5 + x54d5 + x54e5 < 1	x65a5 + x65b5 + x65c5 < 1
x55c1 + x55d1 + x55e1 < 1	x66a1 + x66b1 + x66c1 < 1
x55c2 + x55d2 + x55e2 < 1	x66a2 + x66b2 + x66c2 < 1
x55c3 + x55d3 + x55e3 < 1	x66a3 + x66b3 + x66c3 < 1
x55c4 + x55d4 + x55e4 < 1	x66a4 + x66b4 + x66c4 < 1

Note: < - implies less than or equal to (i.e. $\leq$)

```

x66a5 + x66b5 + x66c5 < 1
x67c1 + x67d1 + x67e1 < 1
x67c2 + x67d2 + x67e2 < 1
x67c3 + x67d3 + x67e3 < 1
x67c4 + x67d4 + x67e4 < 1
x67c5 + x67d5 + x67e5 < 1
x68c1 + x68d1 + x68e1 < 1
x68c2 + x68d2 + x68e2 < 1
x68c3 + x68d3 + x68e3 < 1
x68c4 + x68d4 + x68e4 < 1
x68c5 + x68d5 + x68e5 < 1
x69e1 + x69f1 + x69g1 < 1
x69e2 + x69f2 + x69g2 < 1
x69e3 + x69f3 + x69g3 < 1
x69e4 + x69f4 + x69g4 < 1
x69e5 + x69f5 + x69g5 < 1
x70c1 + x70d1 + x70e1 < 1
x70c2 + x70d2 + x70e2 < 1
x70c3 + x70d3 + x70e3 < 1
x70c4 + x70d4 + x70e4 < 1
x70c5 + x70d5 + x70e5 < 1
x71c5 + x71d5 + x71e5 < 1
x72c2 + x72d2 + x72e2 < 1
x72c3 + x72d3 + x72e3 < 1
x72c4 + x72d4 + x72e4 < 1
x72c5 + x72d5 + x72e5 < 1
x73c4 + x73d4 + x73e4 < 1
x73c5 + x73d5 + x73e5 < 1
x74a5 + x74b5 + x74c5 < 1
x75a3 + x75b3 + x75c3 < 1
x75a4 + x75b4 + x75c4 < 1
x75a5 + x75b5 + x75c5 < 1
x76a4 + x76b4 + x76c4 < 1
x76a5 + x76b5 + x76c5 < 1
x77c5 + x77d5 + x77e5 < 1
x78a5 + x78b5 + x78c5 < 1
x79c4 + x79d4 + x79e4 < 1
x79c5 + x79d5 + x79e5 < 1
x80c3 + x80d3 + x80e3 < 1
x80c4 + x80d4 + x80e4 < 1
x80c5 + x80d5 + x80e5 < 1
x81c5 + x81d5 + x81e5 < 1
x82c3 + x82d3 + x82e3 < 1
x82c4 + x82d4 + x82e4 < 1
x82c5 + x82d5 + x82e5 < 1
x83a3 + x83b3 + x83c3 < 1
x83a4 + x83b4 + x83c4 < 1
x83a5 + x83b5 + x83c5 < 1
x84a3 + x84b3 + x84c3 < 1
x84a4 + x84b4 + x84c4 < 1
x84a5 + x84b5 + x84c5 < 1
x85a5 + x85b5 + x85c5 < 1
x86a4 + x86b4 + x86c4 < 1
x86a5 + x86b5 + x86c5 < 1
x87c3 + x87d3 + x87e3 < 1
x87c4 + x87d4 + x87e4 < 1
x87c5 + x87d5 + x87e5 < 1
x88c4 + x88d4 + x88e4 < 1
x88c5 + x88d5 + x88e5 < 1
x89a5 + x89b5 + x89c5 < 1
x90a3 + x90b3 + x90c3 < 1
x90a4 + x90b4 + x90c4 < 1
x90a5 + x90b5 + x90c5 < 1
x91a5 + x91b5 + x91c5 < 1
x92c3 + x92d3 + x92e3 < 1
x92c4 + x92d4 + x92e4 < 1
x92c5 + x92d5 + x92e5 < 1
x93c4 + x93d4 + x93e4 < 1
x93c5 + x93d5 + x93e5 < 1
x94c2 + x94d2 + x94e2 < 1
x94c3 + x94d3 + x94e3 < 1
x94c4 + x94d4 + x94e4 < 1
x94c5 + x94d5 + x94e5 < 1
x95c4 + x95d4 + x95e4 < 1
x95c5 + x95d5 + x95e5 < 1
x96c2 + x96d2 + x96e2 < 1
x96c3 + x96d3 + x96e3 < 1
x96c4 + x96d4 + x96e4 < 1
x96c5 + x96d5 + x96e5 < 1
x97c2 + x97d2 + x97e2 < 1
x97c3 + x97d3 + x97e3 < 1
x97c4 + x97d4 + x97e4 < 1
x97c5 + x97d5 + x97e5 < 1
x98c5 + x98d5 + x98e5 < 1
x99c5 + x99d5 + x99e5 < 1
x100c4 + x100d4 + x100e4 < 1
x100c5 + x100d5 + x100e5 < 1
x101c5 + x101d5 + x101e5 < 1
x102c5 + x102d5 + x102e5 < 1
x103a5 + x103b5 + x103c5 < 1
x104a5 + x104b5 + x104c5 < 1
x105a4 + x105b4 + x105c4 < 1
x105a5 + x105b5 + x105c5 < 1
x106a5 + x106b5 + x106c5 < 1
x107a3 + x107b3 + x107c3 < 1
x107a4 + x107b4 + x107c4 < 1
x107a5 + x107b5 + x107c5 < 1
x108a2 + x108b2 + x108c2 < 1
x108a3 + x108b3 + x108c3 < 1
x108a4 + x108b4 + x108c4 < 1
x108a5 + x108b5 + x108c5 < 1
x109a2 + x109b2 + x109c2 < 1
x109a3 + x109b3 + x109c3 < 1
x109a4 + x109b4 + x109c4 < 1
x109a5 + x109b5 + x109c5 < 1
x110a4 + x110b4 + x110c4 < 1
x110a5 + x110b5 + x110c5 < 1
x111a3 + x111b3 + x111c3 < 1
x111a4 + x111b4 + x111c4 < 1
x111a5 + x111b5 + x111c5 < 1

```

Note: < - implies less than or equal to (i.e. $\leq$)

```

x112e5 + x112f5 + x112g5 < 1
x113c5 + x113d5 + x113e5 < 1
x114c4 + x114d4 + x114e4 < 1
x114c5 + x114d5 + x114e5 < 1
x115c3 + x115d3 + x115e3 < 1
x115c4 + x115d4 + x115e4 < 1
x115c5 + x115d5 + x115e5 < 1
x116e4 + x116f4 + x116g4 < 1
x116e5 + x116f5 + x116g5 < 1
x117c4 + x117d4 + x117e4 < 1
x117c5 + x117d5 + x117e5 < 1
x118e3 + x118f3 + x118g3 < 1
x118e4 + x118f4 + x118g4 < 1
x118e5 + x118f5 + x118g5 < 1
x1c2 - x1c1 > 0
x1d2 - x1d1 > 0
x1e2 - x1e1 > 0
x1c3 - x1c2 > 0
x1d3 - x1d2 > 0
x1e3 - x1e2 > 0
x1c4 - x1c3 > 0
x1d4 - x1d3 > 0
x1e4 - x1e3 > 0
x1c5 - x1c4 > 0
x1d5 - x1d4 > 0
x1e5 - x1e4 > 0
x2a2 - x2a1 > 0
x2b2 - x2b1 > 0
x2c2 - x2c1 > 0
x2a3 - x2a2 > 0
x2b3 - x2b2 > 0
x2c3 - x2c2 > 0
x2a4 - x2a3 > 0
x2b4 - x2b3 > 0
x2c4 - x2c3 > 0
x2a5 - x2a4 > 0
x2b5 - x2b4 > 0
x2c5 - x2c4 > 0
x3a2 - x3a1 > 0
x3b2 - x3b1 > 0
x3c2 - x3c1 > 0
x3a3 - x3a2 > 0
x3b3 - x3b2 > 0
x3c3 - x3c2 > 0
x3a4 - x3a3 > 0
x3b4 - x3b3 > 0
x3c4 - x3c3 > 0
x3a5 - x3a4 > 0
x3b5 - x3b4 > 0
x3c5 - x3c4 > 0
x4a2 - x4a1 > 0
x4b2 - x4b1 > 0
x4c2 - x4c1 > 0
x4a3 - x4a2 > 0
x4b3 - x4b2 > 0
x4c3 - x4c2 > 0
x4a4 - x4a3 > 0
x4b4 - x4b3 > 0
x4c4 - x4c3 > 0
x4a5 - x4a4 > 0
x4b5 - x4b4 > 0
x4c5 - x4c4 > 0
x5a2 - x5a1 > 0
x5b2 - x5b1 > 0
x5c2 - x5c1 > 0
x5a3 - x5a2 > 0
x5b3 - x5b2 > 0
x5c3 - x5c2 > 0
x5a4 - x5a3 > 0
x5b4 - x5b3 > 0
x5c4 - x5c3 > 0
x5a5 - x5a4 > 0
x5b5 - x5b4 > 0
x5c5 - x5c4 > 0
x6a2 - x6a1 > 0
x6b2 - x6b1 > 0
x6c2 - x6c1 > 0
x6a3 - x6a2 > 0
x6b3 - x6b2 > 0
x6c3 - x6c2 > 0
x6a4 - x6a3 > 0
x6b4 - x6b3 > 0
x6c4 - x6c3 > 0
x6a5 - x6a4 > 0
x6b5 - x6b4 > 0
x6c5 - x6c4 > 0
x7c2 - x7c1 > 0
x7d2 - x7d1 > 0
x7e2 - x7e1 > 0
x7c3 - x7c2 > 0
x7d3 - x7d2 > 0
x7e3 - x7e2 > 0
x7c4 - x7c3 > 0
x7d4 - x7d3 > 0
x7e4 - x7e3 > 0
x7c5 - x7c4 > 0
x7d5 - x7d4 > 0
x7e5 - x7e4 > 0
x8a2 - x8a1 > 0
x8b2 - x8b1 > 0
x8c2 - x8c1 > 0
x8a3 - x8a2 > 0
x8b3 - x8b2 > 0
x8c3 - x8c2 > 0
x8a4 - x8a3 > 0
x8b4 - x8b3 > 0
x8c4 - x8c3 > 0
x8a5 - x8a4 > 0
x8b5 - x8b4 > 0
x8c5 - x8c4 > 0

```

Note: < -implies less than or equal to (i.e. $\leq$)
 > -implies greater than or equal to (i.e. $\geq$)

x9a2 - x9a1 > 0	x13b4 - x13b3 > 0	x18c2 - x18c1 > 0
x9b2 - x9b1 > 0	x13c4 - x13c3 > 0	x18a3 - x18a2 > 0
x9c2 - x9c1 > 0	x13a5 - x13a4 > 0	x18b3 - x18b2 > 0
x9a3 - x9a2 > 0	x13b5 - x13b4 > 0	x18c3 - x18c2 > 0
x9b3 - x9b2 > 0	x13c5 - x13c4 > 0	x18a4 - x18a3 > 0
x9c3 - x9c2 > 0	x14a2 - x14a1 > 0	x18b4 - x18b3 > 0
x9a4 - x9a3 > 0	x14b2 - x14b1 > 0	x18c4 - x18c3 > 0
x9b4 - x9b3 > 0	x14c2 - x14c1 > 0	x18a5 - x18a4 > 0
x9c4 - x9c3 > 0	x14a3 - x14a2 > 0	x18b5 - x18b4 > 0
x9a5 - x9a4 > 0	x14b3 - x14b2 > 0	x18c5 - x18c4 > 0
x9b5 - x9b4 > 0	x14c3 - x14c2 > 0	x19c2 - x19c1 > 0
x9c5 - x9c4 > 0	x14a4 - x14a3 > 0	x19d2 - x19d1 > 0
x10a2 - x10a1 > 0	x14b4 - x14b3 > 0	x19e2 - x19e1 > 0
x10b2 - x10b1 > 0	x14c4 - x14c3 > 0	x19c3 - x19c2 > 0
x10c2 - x10c1 > 0	x14a5 - x14a4 > 0	x19d3 - x19d2 > 0
x10a3 - x10a2 > 0	x14b5 - x14b4 > 0	x19e3 - x19e2 > 0
x10b3 - x10b2 > 0	x14c5 - x14c4 > 0	x19c4 - x19c3 > 0
x10c3 - x10c2 > 0	x15a2 - x15a1 > 0	x19d4 - x19d3 > 0
x10a4 - x10a3 > 0	x15b2 - x15b1 > 0	x19e4 - x19e3 > 0
x10b4 - x10b3 > 0	x15c2 - x15c1 > 0	x19c5 - x19c4 > 0
x10c4 - x10c3 > 0	x15a3 - x15a2 > 0	x19d5 - x19d4 > 0
x10a5 - x10a4 > 0	x15b3 - x15b2 > 0	x19e5 - x19e4 > 0
x10b5 - x10b4 > 0	x15c3 - x15c2 > 0	x20a2 - x20a1 > 0
x10c5 - x10c4 > 0	x15a4 - x15a3 > 0	x20b2 - x20b1 > 0
x11a2 - x11a1 > 0	x15b4 - x15b3 > 0	x20c2 - x20c1 > 0
x11b2 - x11b1 > 0	x15c4 - x15c3 > 0	x20a3 - x20a2 > 0
x11c2 - x11c1 > 0	x15a5 - x15a4 > 0	x20b3 - x20b2 > 0
x11a3 - x11a2 > 0	x15b5 - x15b4 > 0	x20c3 - x20c2 > 0
x11b3 - x11b2 > 0	x15c5 - x15c4 > 0	x20a4 - x20a3 > 0
x11c3 - x11c2 > 0	x16a2 - x16a1 > 0	x20b4 - x20b3 > 0
x11a4 - x11a3 > 0	x16b2 - x16b1 > 0	x20c4 - x20c3 > 0
x11b4 - x11b3 > 0	x16c2 - x16c1 > 0	x20a5 - x20a4 > 0
x11c4 - x11c3 > 0	x16a3 - x16a2 > 0	x20b5 - x20b4 > 0
x11a5 - x11a4 > 0	x16b3 - x16b2 > 0	x20c5 - x20c4 > 0
x11b5 - x11b4 > 0	x16c3 - x16c2 > 0	x21a2 - x21a1 > 0
x11c5 - x11c4 > 0	x16a4 - x16a3 > 0	x21b2 - x21b1 > 0
x12a2 - x12a1 > 0	x16b4 - x16b3 > 0	x21c2 - x21c1 > 0
x12b2 - x12b1 > 0	x16c4 - x16c3 > 0	x21a3 - x21a2 > 0
x12c2 - x12c1 > 0	x16a5 - x16a4 > 0	x21b3 - x21b2 > 0
x12a3 - x12a2 > 0	x16b5 - x16b4 > 0	x21c3 - x21c2 > 0
x12b3 - x12b2 > 0	x16c5 - x16c4 > 0	x21a4 - x21a3 > 0
x12c3 - x12c2 > 0	x17a2 - x17a1 > 0	x21b4 - x21b3 > 0
x12a4 - x12a3 > 0	x17b2 - x17b1 > 0	x21c4 - x21c3 > 0
x12b4 - x12b3 > 0	x17c2 - x17c1 > 0	x21a5 - x21a4 > 0
x12c4 - x12c3 > 0	x17a3 - x17a2 > 0	x21b5 - x21b4 > 0
x12a5 - x12a4 > 0	x17b3 - x17b2 > 0	x21c5 - x21c4 > 0
x12b5 - x12b4 > 0	x17c3 - x17c2 > 0	x22a2 - x22a1 > 0
x12c5 - x12c4 > 0	x17a4 - x17a3 > 0	x22b2 - x22b1 > 0
x13a2 - x13a1 > 0	x17b4 - x17b3 > 0	x22c2 - x22c1 > 0
x13b2 - x13b1 > 0	x17c4 - x17c3 > 0	x22a3 - x22a2 > 0
x13c2 - x13c1 > 0	x17a5 - x17a4 > 0	x22b3 - x22b2 > 0
x13a3 - x13a2 > 0	x17b5 - x17b4 > 0	x22c3 - x22c2 > 0
x13b3 - x13b2 > 0	x17c5 - x17c4 > 0	x22a4 - x22a3 > 0
x13c3 - x13c2 > 0	x18a2 - x18a1 > 0	x22b4 - x22b3 > 0
x13a4 - x13a3 > 0	x18b2 - x18b1 > 0	x22c4 - x22c3 > 0

Note: > - implies greater than or equal to (i.e. $\geq$)

```

x22a5 - x22a4 > 0      x27b3 - x27b2 > 0      x31e5 - x31e4 > 0
x22b5 - x22b4 > 0      x27c3 - x27c2 > 0      x32c2 - x32c1 > 0
x22c5 - x22c4 > 0      x27a4 - x27a3 > 0      x32d2 - x32d1 > 0
x23c2 - x23c1 > 0      x27b4 - x27b3 > 0      x32e2 - x32e1 > 0
x23d2 - x23d1 > 0      x27c4 - x27c3 > 0      x32c3 - x32c2 > 0
x23e2 - x23e1 > 0      x27a5 - x27a4 > 0      x32d3 - x32d2 > 0
x23c3 - x23c2 > 0      x27b5 - x27b4 > 0      x32e3 - x32e2 > 0
x23d3 - x23d2 > 0      x27c5 - x27c4 > 0      x32c4 - x32c3 > 0
x23e3 - x23e2 > 0      x28a2 - x28a1 > 0      x32d4 - x32d3 > 0
x23c4 - x23c3 > 0      x28b2 - x28b1 > 0      x32e4 - x32e3 > 0
x23d4 - x23d3 > 0      x28c2 - x28c1 > 0      x32c5 - x32c4 > 0
x23e4 - x23e3 > 0      x28a3 - x28a2 > 0      x32d5 - x32d4 > 0
x23c5 - x23c4 > 0      x28b3 - x28b2 > 0      x32e5 - x32e4 > 0
x23d5 - x23d4 > 0      x28c3 - x28c2 > 0      x33c2 - x33c1 > 0
x23e5 - x23e4 > 0      x28a4 - x28a3 > 0      x33d2 - x33d1 > 0
x24a2 - x24a1 > 0      x28b4 - x28b3 > 0      x33e2 - x33e1 > 0
x24b2 - x24b1 > 0      x28c4 - x28c3 > 0      x33c3 - x33c2 > 0
x24c2 - x24c1 > 0      x28a5 - x28a4 > 0      x33d3 - x33d2 > 0
x24a3 - x24a2 > 0      x28b5 - x28b4 > 0      x33e3 - x33e2 > 0
x24b3 - x24b2 > 0      x28c5 - x28c4 > 0      x33c4 - x33c3 > 0
x24c3 - x24c2 > 0      x29a2 - x29a1 > 0      x33d4 - x33d3 > 0
x24a4 - x24a3 > 0      x29b2 - x29b1 > 0      x33e4 - x33e3 > 0
x24b4 - x24b3 > 0      x29c2 - x29c1 > 0      x33c5 - x33c4 > 0
x24c4 - x24c3 > 0      x29a3 - x29a2 > 0      x33d5 - x33d4 > 0
x24a5 - x24a4 > 0      x29b3 - x29b2 > 0      x33e5 - x33e4 > 0
x24b5 - x24b4 > 0      x29c3 - x29c2 > 0      x34c2 - x34c1 > 0
x24c5 - x24c4 > 0      x29a4 - x29a3 > 0      x34d2 - x34d1 > 0
x25a2 - x25a1 > 0      x29b4 - x29b3 > 0      x34e2 - x34e1 > 0
x25b2 - x25b1 > 0      x29c4 - x29c3 > 0      x34c3 - x34c2 > 0
x25c2 - x25c1 > 0      x29a5 - x29a4 > 0      x34d3 - x34d2 > 0
x25a3 - x25a2 > 0      x29b5 - x29b4 > 0      x34e3 - x34e2 > 0
x25b3 - x25b2 > 0      x29c5 - x29c4 > 0      x34c4 - x34c3 > 0
x25c3 - x25c2 > 0      x30c2 - x30c1 > 0      x34d4 - x34d3 > 0
x25a4 - x25a3 > 0      x30d2 - x30d1 > 0      x34e4 - x34e3 > 0
x25b4 - x25b3 > 0      x30e2 - x30e1 > 0      x34c5 - x34c4 > 0
x25c4 - x25c3 > 0      x30c3 - x30c2 > 0      x34d5 - x34d4 > 0
x25a5 - x25a4 > 0      x30d3 - x30d2 > 0      x34e5 - x34e4 > 0
x25b5 - x25b4 > 0      x30e3 - x30e2 > 0      x35c2 - x35c1 > 0
x25c5 - x25c4 > 0      x30c4 - x30c3 > 0      x35d2 - x35d1 > 0
x26a2 - x26a1 > 0      x30d4 - x30d3 > 0      x35e2 - x35e1 > 0
x26b2 - x26b1 > 0      x30e4 - x30e3 > 0      x35c3 - x35c2 > 0
x26c2 - x26c1 > 0      x30c5 - x30c4 > 0      x35d3 - x35d2 > 0
x26a3 - x26a2 > 0      x30d5 - x30d4 > 0      x35e3 - x35e2 > 0
x26b3 - x26b2 > 0      x30e5 - x30e4 > 0      x35c4 - x35c3 > 0
x26c3 - x26c2 > 0      x31c2 - x31c1 > 0      x35d4 - x35d3 > 0
x26a4 - x26a3 > 0      x31d2 - x31d1 > 0      x35e4 - x35e3 > 0
x26b4 - x26b3 > 0      x31e2 - x31e1 > 0      x35c5 - x35c4 > 0
x26c4 - x26c3 > 0      x31c3 - x31c2 > 0      x35d5 - x35d4 > 0
x26a5 - x26a4 > 0      x31d3 - x31d2 > 0      x35e5 - x35e4 > 0
x26b5 - x26b4 > 0      x31e3 - x31e2 > 0      x36a2 - x36a1 > 0
x26c5 - x26c4 > 0      x31c4 - x31c3 > 0      x36b2 - x36b1 > 0
x27a2 - x27a1 > 0      x31d4 - x31d3 > 0      x36c2 - x36c1 > 0
x27b2 - x27b1 > 0      x31e4 - x31e3 > 0      x36a3 - x36a2 > 0
x27c2 - x27c1 > 0      x31c5 - x31c4 > 0      x36b3 - x36b2 > 0
x27a3 - x27a2 > 0      x31d5 - x31d4 > 0      x36c3 - x36c2 > 0

```

Note: > - implies greater than or equal to (i.e. $\geq$)

```

x36a4 - x36a3 > 0      x41b2 - x41b1 > 0      x45e4 - x45e3 > 0
x36b4 - x36b3 > 0      x41c2 - x41c1 > 0      x45c5 - x45c4 > 0
x36c4 - x36c3 > 0      x41a3 - x41a2 > 0      x45d5 - x45d4 > 0
x36a5 - x36a4 > 0      x41b3 - x41b2 > 0      x45e5 - x45e4 > 0
x36b5 - x36b4 > 0      x41c3 - x41c2 > 0      x46a2 - x46a1 > 0
x36c5 - x36c4 > 0      x41a4 - x41a3 > 0      x46b2 - x46b1 > 0
x37a2 - x37a1 > 0      x41b4 - x41b3 > 0      x46c2 - x46c1 > 0
x37b2 - x37b1 > 0      x41c4 - x41c3 > 0      x46a3 - x46a2 > 0
x37c2 - x37c1 > 0      x41a5 - x41a4 > 0      x46b3 - x46b2 > 0
x37a3 - x37a2 > 0      x41b5 - x41b4 > 0      x46c3 - x46c2 > 0
x37b3 - x37b2 > 0      x41c5 - x41c4 > 0      x46a4 - x46a3 > 0
x37c3 - x37c2 > 0      x42c2 - x42c1 > 0      x46b4 - x46b3 > 0
x37a4 - x37a3 > 0      x42d2 - x42d1 > 0      x46c4 - x46c3 > 0
x37b4 - x37b3 > 0      x42e2 - x42e1 > 0      x46a5 - x46a4 > 0
x37c4 - x37c3 > 0      x42c3 - x42c2 > 0      x46b5 - x46b4 > 0
x37a5 - x37a4 > 0      x42d3 - x42d2 > 0      x46c5 - x46c4 > 0
x37b5 - x37b4 > 0      x42e3 - x42e2 > 0      x47a2 - x47a1 > 0
x37c5 - x37c4 > 0      x42c4 - x42c3 > 0      x47b2 - x47b1 > 0
x38c2 - x38c1 > 0      x42d4 - x42d3 > 0      x47c2 - x47c1 > 0
x38d2 - x38d1 > 0      x42e4 - x42e3 > 0      x47a3 - x47a2 > 0
x38e2 - x38e1 > 0      x42c5 - x42c4 > 0      x47b3 - x47b2 > 0
x38c3 - x38c2 > 0      x42d5 - x42d4 > 0      x47c3 - x47c2 > 0
x38d3 - x38d2 > 0      x42e5 - x42e4 > 0      x47a4 - x47a3 > 0
x38e3 - x38e2 > 0      x43c2 - x43c1 > 0      x47b4 - x47b3 > 0
x38c4 - x38c3 > 0      x43d2 - x43d1 > 0      x47c4 - x47c3 > 0
x38d4 - x38d3 > 0      x43e2 - x43e1 > 0      x47a5 - x47a4 > 0
x38e4 - x38e3 > 0      x43c3 - x43c2 > 0      x47b5 - x47b4 > 0
x38c5 - x38c4 > 0      x43d3 - x43d2 > 0      x47c5 - x47c4 > 0
x38d5 - x38d4 > 0      x43e3 - x43e2 > 0      x48a2 - x48a1 > 0
x38e5 - x38e4 > 0      x43c4 - x43c3 > 0      x48b2 - x48b1 > 0
x39a2 - x39a1 > 0      x43d4 - x43d3 > 0      x48c2 - x48c1 > 0
x39b2 - x39b1 > 0      x43e4 - x43e3 > 0      x48a3 - x48a2 > 0
x39c2 - x39c1 > 0      x43c5 - x43c4 > 0      x48b3 - x48b2 > 0
x39a3 - x39a2 > 0      x43d5 - x43d4 > 0      x48c3 - x48c2 > 0
x39b3 - x39b2 > 0      x43e5 - x43e4 > 0      x48a4 - x48a3 > 0
x39c3 - x39c2 > 0      x44c2 - x44c1 > 0      x48b4 - x48b3 > 0
x39a4 - x39a3 > 0      x44d2 - x44d1 > 0      x48c4 - x48c3 > 0
x39b4 - x39b3 > 0      x44e2 - x44e1 > 0      x48a5 - x48a4 > 0
x39c4 - x39c3 > 0      x44c3 - x44c2 > 0      x48b5 - x48b4 > 0
x39a5 - x39a4 > 0      x44d3 - x44d2 > 0      x48c5 - x48c4 > 0
x39b5 - x39b4 > 0      x44e3 - x44e2 > 0      x49a2 - x49a1 > 0
x39c5 - x39c4 > 0      x44c4 - x44c3 > 0      x49b2 - x49b1 > 0
x40a2 - x40a1 > 0      x44d4 - x44d3 > 0      x49c2 - x49c1 > 0
x40b2 - x40b1 > 0      x44e4 - x44e3 > 0      x49a3 - x49a2 > 0
x40c2 - x40c1 > 0      x44c5 - x44c4 > 0      x49b3 - x49b2 > 0
x40a3 - x40a2 > 0      x44d5 - x44d4 > 0      x49c3 - x49c2 > 0
x40b3 - x40b2 > 0      x44e5 - x44e4 > 0      x49a4 - x49a3 > 0
x40c3 - x40c2 > 0      x45c2 - x45c1 > 0      x49b4 - x49b3 > 0
x40a4 - x40a3 > 0      x45d2 - x45d1 > 0      x49c4 - x49c3 > 0
x40b4 - x40b3 > 0      x45e2 - x45e1 > 0      x49a5 - x49a4 > 0
x40c4 - x40c3 > 0      x45c3 - x45c2 > 0      x49b5 - x49b4 > 0
x40a5 - x40a4 > 0      x45d3 - x45d2 > 0      x49c5 - x49c4 > 0
x40b5 - x40b4 > 0      x45e3 - x45e2 > 0      x50a2 - x50a1 > 0
x40c5 - x40c4 > 0      x45c4 - x45c3 > 0      x50b2 - x50b1 > 0
x41a2 - x41a1 > 0      x45d4 - x45d3 > 0      x50c2 - x50c1 > 0

```

Note: > - implies greater than or equal to (i.e. $\geq$)

x50a3 - x50a2 > 0	x54d5 - x54d4 > 0	x59e3 - x59e2 > 0
x50b3 - x50b2 > 0	x54e5 - x54e4 > 0	x59c4 - x59c3 > 0
x50c3 - x50c2 > 0	x55c2 - x55c1 > 0	x59d4 - x59d3 > 0
x50a4 - x50a3 > 0	x55d2 - x55d1 > 0	x59e4 - x59e3 > 0
x50b4 - x50b3 > 0	x55e2 - x55e1 > 0	x59c5 - x59c4 > 0
x50c4 - x50c3 > 0	x55c3 - x55c2 > 0	x59d5 - x59d4 > 0
x50a5 - x50a4 > 0	x55d3 - x55d2 > 0	x59e5 - x59e4 > 0
x50b5 - x50b4 > 0	x55e3 - x55e2 > 0	x60a2 - x60a1 > 0
x50c5 - x50c4 > 0	x55c4 - x55c3 > 0	x60b2 - x60b1 > 0
x51a2 - x51a1 > 0	x55d4 - x55d3 > 0	x60c2 - x60c1 > 0
x51b2 - x51b1 > 0	x55e4 - x55e3 > 0	x60a3 - x60a2 > 0
x51c2 - x51c1 > 0	x55c5 - x55c4 > 0	x60b3 - x60b2 > 0
x51a3 - x51a2 > 0	x55d5 - x55d4 > 0	x60c3 - x60c2 > 0
x51b3 - x51b2 > 0	x55e5 - x55e4 > 0	x60a4 - x60a3 > 0
x51c3 - x51c2 > 0	x56c2 - x56c1 > 0	x60b4 - x60b3 > 0
x51a4 - x51a3 > 0	x56d2 - x56d1 > 0	x60c4 - x60c3 > 0
x51b4 - x51b3 > 0	x56e2 - x56e1 > 0	x60a5 - x60a4 > 0
x51c4 - x51c3 > 0	x56c3 - x56c2 > 0	x60b5 - x60b4 > 0
x51a5 - x51a4 > 0	x56d3 - x56d2 > 0	x60c5 - x60c4 > 0
x51b5 - x51b4 > 0	x56e3 - x56e2 > 0	x61a2 - x61a1 > 0
x51c5 - x51c4 > 0	x56c4 - x56c3 > 0	x61b2 - x61b1 > 0
x52a2 - x52a1 > 0	x56d4 - x56d3 > 0	x61c2 - x61c1 > 0
x52b2 - x52b1 > 0	x56e4 - x56e3 > 0	x61a3 - x61a2 > 0
x52c2 - x52c1 > 0	x56c5 - x56c4 > 0	x61b3 - x61b2 > 0
x52a3 - x52a2 > 0	x56d5 - x56d4 > 0	x61c3 - x61c2 > 0
x52b3 - x52b2 > 0	x56e5 - x56e4 > 0	x61a4 - x61a3 > 0
x52c3 - x52c2 > 0	x57c2 - x57c1 > 0	x61b4 - x61b3 > 0
x52a4 - x52a3 > 0	x57d2 - x57d1 > 0	x61c4 - x61c3 > 0
x52b4 - x52b3 > 0	x57e2 - x57e1 > 0	x61a5 - x61a4 > 0
x52c4 - x52c3 > 0	x57c3 - x57c2 > 0	x61b5 - x61b4 > 0
x52a5 - x52a4 > 0	x57d3 - x57d2 > 0	x61c5 - x61c4 > 0
x52b5 - x52b4 > 0	x57e3 - x57e2 > 0	x62a2 - x62a1 > 0
x52c5 - x52c4 > 0	x57c4 - x57c3 > 0	x62b2 - x62b1 > 0
x53a2 - x53a1 > 0	x57d4 - x57d3 > 0	x62c2 - x62c1 > 0
x53b2 - x53b1 > 0	x57e4 - x57e3 > 0	x62a3 - x62a2 > 0
x53c2 - x53c1 > 0	x57c5 - x57c4 > 0	x62b3 - x62b2 > 0
x53a3 - x53a2 > 0	x57d5 - x57d4 > 0	x62c3 - x62c2 > 0
x53b3 - x53b2 > 0	x57e5 - x57e4 > 0	x62a4 - x62a3 > 0
x53c3 - x53c2 > 0	x58c2 - x58c1 > 0	x62b4 - x62b3 > 0
x53a4 - x53a3 > 0	x58d2 - x58d1 > 0	x62c4 - x62c3 > 0
x53b4 - x53b3 > 0	x58e2 - x58e1 > 0	x62a5 - x62a4 > 0
x53c4 - x53c3 > 0	x58c3 - x58c2 > 0	x62b5 - x62b4 > 0
x53a5 - x53a4 > 0	x58d3 - x58d2 > 0	x62c5 - x62c4 > 0
x53b5 - x53b4 > 0	x58e3 - x58e2 > 0	x63a2 - x63a1 > 0
x53c5 - x53c4 > 0	x58c4 - x58c3 > 0	x63b2 - x63b1 > 0
x54c2 - x54c1 > 0	x58d4 - x58d3 > 0	x63c2 - x63c1 > 0
x54d2 - x54d1 > 0	x58e4 - x58e3 > 0	x63a3 - x63a2 > 0
x54e2 - x54e1 > 0	x58c5 - x58c4 > 0	x63b3 - x63b2 > 0
x54c3 - x54c2 > 0	x58d5 - x58d4 > 0	x63c3 - x63c2 > 0
x54d3 - x54d2 > 0	x58e5 - x58e4 > 0	x63a4 - x63a3 > 0
x54e3 - x54e2 > 0	x59c2 - x59c1 > 0	x63b4 - x63b3 > 0
x54c4 - x54c3 > 0	x59d2 - x59d1 > 0	x63c4 - x63c3 > 0
x54d4 - x54d3 > 0	x59e2 - x59e1 > 0	x63a5 - x63a4 > 0
x54e4 - x54e3 > 0	x59c3 - x59c2 > 0	x63b5 - x63b4 > 0
x54c5 - x54c4 > 0	x59d3 - x59d2 > 0	x63c5 - x63c4 > 0

Note: > - implies greater than or equal to (i.e. $\geq$)

x64a2 - x64a1 > 0	x68d4 - x68d3 > 0	x96e5 - x96e4 > 0
x64b2 - x64b1 > 0	x68e4 - x68e3 > 0	x97c3 - x97c2 > 0
x64c2 - x64c1 > 0	x68c5 - x68c4 > 0	x97d3 - x97d2 > 0
x64a3 - x64a2 > 0	x68d5 - x68d4 > 0	x97e3 - x97e2 > 0
x64b3 - x64b2 > 0	x68e5 - x68e4 > 0	x97c4 - x97c3 > 0
x64c3 - x64c2 > 0	x69e2 - x69e1 > 0	x97d4 - x97d3 > 0
x64a4 - x64a3 > 0	x69f2 - x69f1 > 0	x97e4 - x97e3 > 0
x64b4 - x64b3 > 0	x69g2 - x69g1 > 0	x97c5 - x97c4 > 0
x64c4 - x64c3 > 0	x69e3 - x69e2 > 0	x97d5 - x97d4 > 0
x64a5 - x64a4 > 0	x69f3 - x69f2 > 0	x97e5 - x97e4 > 0
x64b5 - x64b4 > 0	x69g3 - x69g2 > 0	x108a3 - x108a2 > 0
x64c5 - x64c4 > 0	x69e4 - x69e3 > 0	x108b3 - x108b2 > 0
x65a2 - x65a1 > 0	x69f4 - x69f3 > 0	x108c3 - x108c2 > 0
x65b2 - x65b1 > 0	x69g4 - x69g3 > 0	x108a4 - x108a3 > 0
x65c2 - x65c1 > 0	x69e5 - x69e4 > 0	x108b4 - x108b3 > 0
x65a3 - x65a2 > 0	x69f5 - x69f4 > 0	x108c4 - x108c3 > 0
x65b3 - x65b2 > 0	x69g5 - x69g4 > 0	x108a5 - x108a4 > 0
x65c3 - x65c2 > 0	x70c2 - x70c1 > 0	x108b5 - x108b4 > 0
x65a4 - x65a3 > 0	x70d2 - x70d1 > 0	x108c5 - x108c4 > 0
x65b4 - x65b3 > 0	x70e2 - x70e1 > 0	x109a3 - x109a2 > 0
x65c4 - x65c3 > 0	x70c3 - x70c2 > 0	x109b3 - x109b2 > 0
x65a5 - x65a4 > 0	x70d3 - x70d2 > 0	x109c3 - x109c2 > 0
x65b5 - x65b4 > 0	x70e3 - x70e2 > 0	x109a4 - x109a3 > 0
x65c5 - x65c4 > 0	x70c4 - x70c3 > 0	x109b4 - x109b3 > 0
x66a2 - x66a1 > 0	x70d4 - x70d3 > 0	x109c4 - x109c3 > 0
x66b2 - x66b1 > 0	x70e4 - x70e3 > 0	x109a5 - x109a4 > 0
x66c2 - x66c1 > 0	x70c5 - x70c4 > 0	x109b5 - x109b4 > 0
x66a3 - x66a2 > 0	x70d5 - x70d4 > 0	x109c5 - x109c4 > 0
x66b3 - x66b2 > 0	x70e5 - x70e4 > 0	x75a4 - x75a3 > 0
x66c3 - x66c2 > 0	x72c3 - x72c2 > 0	x75b4 - x75b3 > 0
x66a4 - x66a3 > 0	x72d3 - x72d2 > 0	x75c4 - x75c3 > 0
x66b4 - x66b3 > 0	x72e3 - x72e2 > 0	x75a5 - x75a4 > 0
x66c4 - x66c3 > 0	x72c4 - x72c3 > 0	x75b5 - x75b4 > 0
x66a5 - x66a4 > 0	x72d4 - x72d3 > 0	x75c5 - x75c4 > 0
x66b5 - x66b4 > 0	x72e4 - x72e3 > 0	x80c4 - x80c3 > 0
x66c5 - x66c4 > 0	x72c5 - x72c4 > 0	x80d4 - x80d3 > 0
x67c2 - x67c1 > 0	x72d5 - x72d4 > 0	x80e4 - x80e3 > 0
x67d2 - x67d1 > 0	x72e5 - x72e4 > 0	x80c5 - x80c4 > 0
x67e2 - x67e1 > 0	x94c3 - x94c2 > 0	x80d5 - x80d4 > 0
x67c3 - x67c2 > 0	x94d3 - x94d2 > 0	x80e5 - x80e4 > 0
x67d3 - x67d2 > 0	x94e3 - x94e2 > 0	x82c4 - x82c3 > 0
x67e3 - x67e2 > 0	x94c4 - x94c3 > 0	x82d4 - x82d3 > 0
x67c4 - x67c3 > 0	x94d4 - x94d3 > 0	x82e4 - x82e3 > 0
x67d4 - x67d3 > 0	x94e4 - x94e3 > 0	x82c5 - x82c4 > 0
x67e4 - x67e3 > 0	x94c5 - x94c4 > 0	x82d5 - x82d4 > 0
x67c5 - x67c4 > 0	x94d5 - x94d4 > 0	x82e5 - x82e4 > 0
x67d5 - x67d4 > 0	x94e5 - x94e4 > 0	x83a4 - x83a3 > 0
x67e5 - x67e4 > 0	x96c3 - x96c2 > 0	x83b4 - x83b3 > 0
x68c2 - x68c1 > 0	x96d3 - x96d2 > 0	x83c4 - x83c3 > 0
x68d2 - x68d1 > 0	x96e3 - x96e2 > 0	x83a5 - x83a4 > 0
x68e2 - x68e1 > 0	x96c4 - x96c3 > 0	x83b5 - x83b4 > 0
x68c3 - x68c2 > 0	x96d4 - x96d3 > 0	x83c5 - x83c4 > 0
x68d3 - x68d2 > 0	x96e4 - x96e3 > 0	x84a4 - x84a3 > 0
x68e3 - x68e2 > 0	x96c5 - x96c4 > 0	x84b4 - x84b3 > 0
x68c4 - x68c3 > 0	x96d5 - x96d4 > 0	x84c4 - x84c3 > 0

Note: > - implies greater than or equal to (i.e. $\geq$)

```

x84a5 - x84a4 > 0
x84b5 - x84b4 > 0
x84c5 - x84c4 > 0
x87c4 - x87c3 > 0
x87d4 - x87d3 > 0
x87e4 - x87e3 > 0
x87c5 - x87c4 > 0
x87d5 - x87d4 > 0
x87e5 - x87e4 > 0
x90a4 - x90a3 > 0
x90b4 - x90b3 > 0
x90c4 - x90c3 > 0
x90a5 - x90a4 > 0
x90b5 - x90b4 > 0
x90c5 - x90c4 > 0
x92c4 - x92c3 > 0
x92d4 - x92d3 > 0
x92e4 - x92e3 > 0
x92c5 - x92c4 > 0
x92d5 - x92d4 > 0
x92e5 - x92e4 > 0
x107a4 - x107a3 > 0
x107b4 - x107b3 > 0
x107c4 - x107c3 > 0
x107a5 - x107a4 > 0
x107b5 - x107b4 > 0
x107c5 - x107c4 > 0
x110a5 - x110a4 > 0
x110b5 - x110b4 > 0
x110c5 - x110c4 > 0
x111a4 - x111a3 > 0
x111b4 - x111b3 > 0
x111c4 - x111c3 > 0
x111a5 - x111a4 > 0
x111b5 - x111b4 > 0
x111c5 - x111c4 > 0
x115c4 - x115c3 > 0
x115d4 - x115d3 > 0
x115e4 - x115e3 > 0
x115c5 - x115c4 > 0
x115d5 - x115d4 > 0
x115e5 - x115e4 > 0
x118e4 - x118e3 > 0
x118f4 - x118f3 > 0
x118g4 - x118g3 > 0
x118e5 - x118e4 > 0
x118f5 - x118f4 > 0
x118g5 - x118g4 > 0
x73c5 - x73c4 > 0
x73d5 - x73d4 > 0
x73e5 - x73e4 > 0
x76a5 - x76a4 > 0
x76b5 - x76b4 > 0
x76c5 - x76c4 > 0
x79c5 - x79c4 > 0
x79d5 - x79d4 > 0
x79e5 - x79e4 > 0
x86a5 - x86a4 > 0
x86b5 - x86b4 > 0
x86c5 - x86c4 > 0
x88c5 - x88c4 > 0
x88d5 - x88d4 > 0
x88e5 - x88e4 > 0
x93c5 - x93c4 > 0
x93d5 - x93d4 > 0
x93e5 - x93e4 > 0
x95c5 - x95c4 > 0
x95d5 - x95d4 > 0
x95e5 - x95e4 > 0
x100c5 - x100c4 > 0
x100d5 - x100d4 > 0
x100e5 - x100e4 > 0
x105a5 - x105a4 > 0
x105b5 - x105b4 > 0
x105c5 - x105c4 > 0
x114c5 - x114c4 > 0
x114d5 - x114d4 > 0
x114e5 - x114e4 > 0
x116e5 - x116e4 > 0
x116f5 - x116f4 > 0
x116g5 - x116g4 > 0
x117c5 - x117c4 > 0
x117d5 - x117d4 > 0
x117e5 - x117e4 > 0

```

END

Note: > - implies greater than or equal to (i.e. $\geq$)

Appendix D
Results of Budget Sensitivity Analysis

Table D.1 Results from Contract Section Worth Model for Budget Scenario 1:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2					*	c	5.8
3					*	a	7.1
4		*				c	3.7
5				*		c	6.1
6				*		c	6.4
7		*				e	5.1
8			*			c	6.0
9		*				c	3.7
10			*			c	4.1
11			*			c	4.4
12					*	c	3.6
13			*			c	4.4
14		*				c	3.7
15				*		c	5.1
16			*			b	6.4
17				*		c	6.1
18		*				c	3.7
19	*					e	4.5
20		*				c	2.9
21		*				c	6.2
22				*		c	7.8
23		*				e	5.3
24				*		c	4.1

Table D.1 Results from Contract Section Worth Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
25					*	c	5.7
26						n/s	5.2
27					*	b	4.4
28						n/s	5.5
29					*	c	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33			*			e	7.3
34	*					e	0.7
35				*		d	6.6
36	*					c	3.5
37						n/s	5.3
38			*			e	6.6
39			*			c	2.7
40					*	c	5.8
41			*			c	2.7
42	*					e	3.2
43			*			e	5.8
44				*		e	4.0
45			*			e	4.4
46		*				c	2.2
47		*				c	3.7
48	*					c	2.7

Table D.1 Results from Contract Section Worth Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity [†]	Section Length
	1982	1983	1984	1985	1986		
49						n/s	5.3
50				*		c	3.1
51			*			c	5.3
52					*	c	4.2
53	*					c	1.7
54	*					e	4.4
55				*		e	4.0
56				*		e	5.8
57	*					e	4.5
58		*				e	6.4
59			*			e	5.3
60				*		c	9.2
61			*			c	6.4
62		*				c	6.9
63				*		c	6.4
64	*					c	0.4
65					*	c	9.2
66		*				c	5.3
67		*				e	6.4
68	*					e	4.5
69	*					g	2.5
70	*					e	3.7
71					*	e	1.6
72		*				e	3.2

Table D.1 Results from Contract Section Worth Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
73				*		e	1.2
74					*	c	5.5
75				*		c	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79				*		e	1.4
80			*			e	2.5
81					*	e	1.4
82					*	e	5.4
83					*	c	3.6
84				*		c	5.1
85					*	c	3.7
86					*	c	4.1
87			*			e	4.0
88				*		e	4.4
89					*	c	3.6
90					*	a	3.7
91					*	c	4.1
92			*			e	4.0
93				*		e	3.3
94					*	e	6.6
95				*		e	5.8
96		*				e	0.7

Table D.1 Results from Contract Section Worth Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
97				*		e	7.3
98					*	e	3.7
99					*	e	6.6
100				*		c	4.8
101					*	e	0.7
102					*	e	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107					*	c	5.8
108			*			c	5.4
109			*			c	3.5
110					*	c	7.5
111				*		c	5.8
112					*	g	2.5
113					*	e	3.2
114				*		e	1.3
115			*			e	2.9
116				*		g	2.5
117				*		e	3.4
118			*			g	1.2
Contracts	13	17	22	27	31	110	93.2 ++
Miles	38.8	74.9	99.9	130.6	139.5	483.2	91.7 +++

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

++ - indicates percent of contracts that would be resurfaced

+++ - indicates percent of miles that would be resurfaced

Table D.2 Results from Contract Section Worth Model for Budget Scenario 2:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity [†]	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2						n/s	5.8
3						n/s	7.1
4			*			c	3.7
5				*		c	6.1
6					*	c	6.4
7		*				e	5.1
8				*		c	6.0
9			*			c	3.7
10			*			c	4.1
11			*			c	4.4
12						n/s	3.6
13			*			c	4.4
14		*				c	3.7
15				*		c	5.1
16			*			c	6.4
17					*	c	6.1
18			*			c	3.7
19	*					e	4.5
20		*				c	2.9
21		*				c	6.2
22				*		c	7.8
23		*				e	5.3
24				*		c	4.1

Table D.2 Results from Contract Section Worth Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
25					*	c	5.7
26						n/s	5.2
27					*	a	4.4
28					*	a	5.5
29					*	c	4.4
30		*	.			e	5.8
31	*					e	2.0
32						n/s	4.8
33			*			e	7.3
34	*					e	0.7
35					*	e	6.6
36	*					c	3.5
37						n/s	5.3
38			*			e	6.6
39			*			c	2.7
40				*		c	5.8
41			*			c	2.7
42	*					e	3.2
43				*		e	5.8
44			*			e	4.0
45			*			e	4.4
46	*					c	2.2
47		*				c	3.7
48	*					c	2.7

Table D.2 Results from Contract Section Worth Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
49				*		c	5.3
50				*		c	3.1
51			*			c	5.3
52					*	c	4.2
53		*				c	1.7
54	*					e	4.4
55					*	e	4.0
56				*		e	5.8
57	*					e	4.5
58		*				e	6.4
59		*				e	5.3
60				*		c	9.2
61			*			c	6.4
62		*				c	6.9
63				*		c	6.4
64	*					c	0.4
65						n/s	9.2
66		*				c	5.3
67		*				e	6.4
68	*					e	4.5
69	*					g	2.5
70	*					e	3.7
71					*	e	1.6
72		*				e	3.2

Table D.2 Results from Contract Section Worth Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73				*		e	1.2
74						n/s	5.5
75						n/s	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79				*		e	1.4
80			*			e	2.5
81					*	e	1.4
82					*	e	5.4
83					*	c	3.6
84					*	c	5.1
85					*	c	3.7
86					*	c	4.1
87			*			e	4.0
88				*		e	4.4
89					*	c	3.6
90					*	a	3.7
91					*	c	4.1
92			*			e	4.0
93				*		e	3.3
94					*	e	6.6
95				*		e	5.8
96		*				e	0.7

Table D.2 Results from Contract Section Worth Model for Budget Scenario 2: Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
97				*		e	7.3
98					*	e	3.7
99					*	c	6.6
100				*		c	4.8
101					*	e	0.7
102					*	e	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109			*			c	3.5
110						n/s	7.5
111				*		c	5.8
112					*	g	2.5
113					*	e	3.2
114				*		e	1.3
115			*			e	2.9
116					*	g	2.5
117					*	e	3.4
118			*			g	1.2
Contracts	13	15	22	22	31	103	87.3 ⁺⁺
Miles	38.8	68.6	92.5	111	128.8	439.7	83.5 ⁺⁺⁺

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

++ - indicates percent of contracts that would be resurfaced

+++ - indicates percent of miles that would be resurfaced

Table D.3 Results from Contract Section Worth Model for Budget Scenario 3:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
1		*				e	4.6
2					*	c	5.8
3						n/s	7.1
4		*				c	3.7
5				*		c	6.1
6					*	a	6.4
7		*				e	5.1
8				*		c	6.0
9			*			c	3.7
10				*		c	4.1
11			*			c	4.4
12			*			c	3.6
13			*			c	4.4
14			*			c	3.7
15				*		c	5.1
16				*		c	6.4
17					*	c	6.1
18			*			c	3.7
19	*					e	4.5
20		*				c	2.9
21		*				c	6.2
22				*		c	7.8
23		*				e	5.3
24					*	c	4.1

Table D.3 Results from Contract Section Worth Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity [†]	Section Length
	1982	1983	1984	1985	1986		
25						n/s	5.7
26						n/s	5.2
27						n/s	4.4
28					*	c	5.5
29						n/s	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33			*			e	7.3
34	*					e	0.7
35					*	e	6.6
36	*					c	3.5
37						n/s	5.3
38			*			e	6.6
39					*	c	2.7
40						n/s	5.8
41			*			c	2.7
42	*					e	3.2
43				*		e	5.8
44				*		e	4.0
45				*		e	4.4
46	*					c	2.2
47			*			c	3.7
48	*					c	2.7

Table D.3 Results from Contract Section Worth Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity [†]	Section Length
	1982	1983	1984	1985	1986		
49					*	c	5.3
50					*	c	3.1
51			*			c	5.3
52						n/s	4.2
53			*			c	1.7
54	*					e	4.4
55						n/s	4.0
56					*	e	5.8
57	*					e	4.5
58		*				e	6.4
59		*				e	5.3
60				*		c	9.2
61			*			c	6.4
62			*			c	6.9
63					*	c	6.4
64	*					c	0.4
65						n/s	9.2
66		*				c	5.3
67		*				e	6.4
68	*					e	4.5
69	*					g	2.5
70	*					e	3.7
71					*	e	1.6
72		*				e	3.2

Table D.3 Results from Contract Section Worth Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
73				*		c	1.2
74						n/s	5.5
75					*	c	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79				*		e	1.4
80			*			e	2.5
81					*	e	1.4
82						n/s	5.4
83						n/s	3.6
84					*	c	5.1
85					*	c	3.7
86						n/s	4.1
87			*			e	4.0
88				*		e	4.4
89						n/s	3.6
90					*	a	3.7
91					*	c	4.1
92			*			e	4.0
93				*		e	3.3
94					*	d	6.6
95				*		e	5.8
96		*				e	0.7

Table D.3 Results from Contract Section Worth Model for Budget Scenario 3: Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
97				*		e	7.3
98					*	e	3.7
99						n/s	6.6
100					*	c	4.8
101					*	e	0.7
102					*	e	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109			*			c	3.5
110						n/s	7.5
111					*	c	5.8
112						n/s	2.5
113					*	e	3.2
114				*		e	1.3
115			*			e	2.9
116					*	g	2.5
117				*		e	3.4
118			*			g	1.2
Contracts	13	13	20	19	29	94	79.7 ⁺⁺
Miles	38.8	60.9	82.2	92.2	125.1	399.2	75.8 ⁺⁺⁺

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

++ - indicates percent of contracts that would be resurfaced

+++ - indicates percent of miles that would be resurfaced

Table D.4 Results from Contract Section Worth Model for Budget Scenario 4:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2						n/s	5.8
3						n/s	7.1
4		*				c	3.7
5					*	c	6.1
6						n/s	6.4
7		*				e	5.1
8				*		c	6.0
9			*			c	3.7
10			*			c	4.1
11			*			c	4.4
12						n/s	3.6
13				*		c	4.4
14		*				c	3.7
15					*	c	5.1
16				*		c	6.4
17						n/s	6.1
18			*			c	3.7
19	*					e	4.5
20			*			c	2.9
21		*				c	6.2
22				*		c	7.8
23		*				e	5.3
24					*	c	4.1

Table D.4 Results from Contract Section Worth Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
25						n/s	5.7
26						n/s	5.2
27						n/s	4.4
28						n/s	5.5
29						n/s	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33				*		e	7.3
34	*					e	0.7
35						n/s	6.6
36	*					c	3.5
37						n/s	5.3
38			*			e	6.6
39					*	c	2.7
40						n/s	5.8
41				*		c	2.7
42	*					e	3.2
43					*	e	5.8
44					*	e	4.0
45				*		e	4.4
46	*					c	2.2
47			*			c	3.7
48	*					c	2.7

Table D.4 Results from Contract Section Worth Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
49					*	c	5.3
50						n/s	3.1
51				*		c	5.3
52						n/s	4.2
53	*					c	1.7
54	*					e	4.4
55						n/s	4.0
56					*	e	5.8
57	*					e	4.5
58			*			e	6.4
59		*				e	5.3
60				*		c	9.2
61			*			c	6.4
62			*			c	6.9
63					*	c	6.4
64	*					c	0.4
65						n/s	9.2
66			*			c	5.3
67		*				e	6.4
68	*					e	4.5
69	*					g	2.5
70		*				e	3.7
71					*	e	1.6
72				*		c	3.2

Table D.4 Results from Contract Section Worth Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73						n/s	1.2
74						n/s	5.5
75						n/s	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79				*		e	1.4
80				*		e	2.5
81					*	e	1.4
82						n/s	5.4
83						n/s	3.6
84						n/s	5.1
85					*	c	3.7
86						n/s	4.1
87			*			e	4.0
88				*		e	4.4
89						n/s	3.6
90					*	a	3.7
91						n/s	4.1
92			*			e	4.0
93					*	e	3.3
94						n/s	6.6
95				*		e	5.8
96		*				e	0.7

Table D.4 Results from Contract Section Worth Model for Budget Scenario 4: Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
97					*	e	7.3
98					*	e	3.7
99						n/s	6.6
100					*	c	4.8
101					*	e	0.7
102						n/s	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109				*		c	3.5
110						n/s	7.5
111					*	c	5.8
112					*	g	2.5
113					*	e	3.2
114				*		e	1.3
115			*			e	2.9
116				*		g.	2.5
117				*		e	3.4
118				*		g	1.2
Contracts	13	10	15	20	24	82	69.5 ⁺⁺
Miles	36.8	45.9	69.6	87.9	95.7	335.9	63.8 ⁺⁺⁺

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

⁺⁺ - indicates percent of contracts that would be resurfaced⁺⁺⁺ - indicates percent of miles that would be resurfaced

Table D.5 Results from Contract Section Worth Model for Budget Scenario 5: Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2						n/s	5.8
3						n/s	7.1
4		*				c	3.7
5					*	c	6.1
6						n/s	6.4
7						n/s	5.1
8				*		c	6.0
9			*			c	3.7
10					*	c	4.1
11				*		c	4.4
12						n/s	3.6
13				*		c	4.4
14		*				c	3.7
15						n/s	5.1
16				*		c	6.4
17						n/s	6.1
18			*			c	3.7
19	*					e	4.5
20			*			c	2.9
21		*				c	6.2
22					*	c	7.8
23	*					e	5.3
24					*	c	4.1

Table D.5 Results from Contract Section Worth Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
25						n/s	5.7
26						n/s	5.2
27						n/s	4.4
28						n/s	5.5
29						n/s	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33				*		e	7.3
34	*					e	0.7
35						n/s	6.6
36	*					c	3.5
37						n/s	5.3
38				*		e	6.6
39					*	c	2.7
40						n/s	5.8
41					*	c	2.7
42	*					e	3.2
43					*	e	5.8
44						n/s	4.0
45						n/s	4.4
46	*					c	2.2
47			*			c	3.7
48		*				c	2.7

Table D.5 Results from Contract Section Worth Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
49						n/s	5.3
50						n/s	3.1
51				*		c	5.3
52						n/s	4.2
53	*					c	1.7
54	*					e	4.4
55						n/s	4.0
56						n/s	5.8
57	*					e	4.5
58			*			e	6.4
59			*			e	5.3
60					*	c	9.2
61			*			c	6.4
62			*			c	6.9
63						n/s	6.4
64	*					c	0.4
65						n/s	9.2
66			*			c	5.3
67		*				e	6.4
68	*					e	4.5
69	*					g	2.5
70						n/s	3.7
71					*	e	1.6
72		*				e	3.2

Table D.5 Results from Contract Section Worth Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73				*		c	1.2
74						n/s	5.5
75						n/s	4.4
76					*	c	5.2
77					*	e	1.7
78						n/s	3.3
79				*		c	1.4
80			*			e	2.5
81					*	e	1.4
82						n/s	5.4
83						n/s	3.6
84						n/s	5.1
85					*	c	3.7
86						n/s	4.1
87				*		e	4.0
88				*		e	4.4
89						n/s	3.6
90					*	a	3.7
91						n/s	4.1
92				*		e	4.0
93						n/s	3.3
94						n/s	6.6
95					*	e	5.8
96		*				e	0.7

Table D.5 Results from Contract Section Worth Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
97						n/s	7.3
98					*	e	3.7
99						n/s	6.6
100						n/s	4.8
101					*	e	0.7
102						n/s	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109					*	c	3.5
110						n/s	7.5
111				*		c	5.8
112					*	g	2.5
113					*	e	3.2
114				*		e	1.3
115			*			e	2.9
116					*	g	2.5
117				*		e	3.4
118					*	g	1.2
Contracts	13	8	12	15	23	71	60.2 ⁺⁺
Miles	39.4	32.4	54.3	65.9	86.6	278.6	52.9 ⁺⁺⁺

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

++ - indicates percent of contracts that would be resurfaced

+++ - indicates percent of miles that would be resurfaced

Table D.6 Results from Roughness Reduction Model for Budget Scenario 1:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2				*		c	5.8
3						n/s	7.1
4		*				c	3.7
5		*				c	6.1
6				*		c	6.4
7			*			e	5.1
8			*			c	6.0
9		*				c	3.7
10			*			c	4.1
11		*				c	4.4
12		*				c	3.6
13				*		c	4.4
14		*				c	3.7
15			*			c	5.1
16			*			c	6.4
17		*				c	6.1
18		*				c	3.7
19		*				e	4.5
20	*					c	2.9
21	*					c	6.2
22			*			c	7.8
23	*					e	5.3
24			*			c	4.1

Table D.6 Results from Roughness Reduction Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
25				*		c	5.7
26					*	c	5.2
27				*		c	4.4
28				*		c	5.5
29				*		c	4.4
30		*				e	5.8
31	*					e	2.0
32					*	e	4.8
33				*		e	7.3
34	*					e	0.7
35				*		e	6.6
36		*				c	3.5
37					*	c	5.3
38				*		e	6.6
39	*					c	2.7
40					*	c	5.8
41	*					c	2.7
42	*					e	3.2
43			*			e	5.8
44				*		e	4.0
45			*			e	4.4
46	*					c	2.2
47				*		c	3.7
48	*					c	2.7

Table D.6 Results from Roughness Reduction Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
49			*			c	5.3
50			*			c	3.1
51			*			c	5.3
52				*		c	4.2
53	*					c	1.7
54	*					e	4.4
55					*	e	4.0
56				*		e	5.8
57				*		e	4.5
58		*				e	6.4
59			*			e	5.3
60			*			c	9.2
61		*				c	6.4
62		*				c	6.9
63				*		c	6.4
64	*					c	0.4
65					*	c	9.2
66		*				c	5.3
67			*			e	6.4
68		*				e	4.5
69	*					g	2.5
70				*		e	3.7
71					*	e	1.6
72					*	e	3.2

Table D.6 Results from Roughness Reduction Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73					*	c	1.2
74					*	c	5.5
75					*	c	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79				*		c	1.4
80			*			e	2.5
81					*	e	1.4
82					*	e	5.4
83				*		c	3.6
84					*	c	5.1
85					*	c	3.7
86					*	c	4.1
87				*		e	4.0
88				*		e	4.4
89					*	c	3.6
90					*	a	3.7
91					*	c	4.1
92				*		e	4.0
93					*	e	3.3
94					*	e	6.6
95					*	e	5.8
96		*				e	0.7

Table D.6 Results from Roughness Reduction Model for Budget Scenario 1:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
97						n/s	7.3
98					*	e	3.7
99						n/s	6.6
100					*	c	4.8
101					*	e	0.7
102						n/s	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107					*	c	5.8
108					*	c	5.4
109				*		c	3.5
110					*	c	7.5
111				*		c	5.8
112					*	g	2.5
113					*	e	3.2
114				*		e	1.3
115			*			e	2.9
116				*		g	2.5
117				*		e	3.4
118			*			g	1.2
Contracts	14	17	19	28	33	111	94.1 ++
Miles	39.6	79	94.6	128.5	139.3	481	91.3 +++

Note: * - indicates the year the sections would be resurfaced
+ - see Table 7.5 for resurfacing activity code
n/s - contract section not selected for resurfacing
++ - indicates percent of contracts that would be resurfaced
+++ - indicates percent of miles that would be resurfaced

Table D.7 Results from Roughness Reduction Model for Budget Scenario 2:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2				*		c	5.8
3			*			c	7.1
4	*					c	3.7
5			*			c	6.1
6				*		c	6.4
7		*				e	5.1
8			*			c	6.0
9			*			c	3.7
10			*			c	4.1
11		*				c	4.4
12				*		c	3.6
13			*			c	4.4
14		*				c	3.7
15				*		c	5.1
16			*			c	6.4
17				*		c	6.1
18		*				c	3.7
19		*				e	4.5
20	*					c	2.9
21	*					c	6.2
22			*			c	7.8
23	*					e	5.3
24			*			c	4.1

Table D.7 Results from Roughness Reduction Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity [†]	Section Length
	1982	1983	1984	1985	1986		
25					*	c	5.7
26					*	c	5.2
27						n/s	4.4
28				*		c	5.5
29				*		c	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33				*		e	7.3
34		*				e	0.7
35					*	e	6.6
36		*				c	3.5
37					*	c	5.3
38				*		e	6.6
39	*					c	2.7
40					*	c	5.8
41	*					c	2.7
42	*					e	3.2
43			*			e	5.8
44				*		e	4.0
45				*		e	4.4
46	*					c	2.2
47			*			c	3.7
48	*					c	2.7

Table D.7 Results from Roughness Reduction Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
49			*			c	5.3
50			*			c	3.1
51			*			c	5.3
52				*		c	4.2
53		*				c	1.7
54	*					e	4.4
55					*	e	4.0
56				*		e	5.8
57				*		e	4.5
58		*				e	6.4
59			*			e	5.3
60			*			c	9.2
61		*				c	6.4
62		*				c	6.9
63				*		c	6.4
64	*					c	0.4
65					*	c	9.2
66		*				c	5.3
67		*				e	6.4
68		*				e	4.5
69	*					g	2.5
70					*	e	3.7
71					*	e	1.6
72				*		e	3.2

Table D.7 Results from Roughness Reduction Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73					*	c	1.2
74						n/s	5.5
75					*	c	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79				*		c	1.4
80			*			e	2.5
81					*	e	1.4
82					*	d	5.4
83				*		c	3.6
84					*	c	5.1
85					*	c	3.7
86					*	c	4.1
87					*	e	4.0
88				*		e	4.4
89					*	c	3.6
90					*	a	3.7
91					*	c	4.1
92					*	e	4.0
93						n/s	3.3
94						n/s	6.6
95					*	e	5.8
96		*				e	0.7

Table D.7 Results from Roughness Reduction Model for Budget Scenario 2:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity †	Section Length
	1982	1983	1984	1985	1986		
97						n/s	7.3
98					*	e	3.7
99						n/s	6.6
100					*	c	4.8
101					*	e	0.7
102						n/s	7.3
103						n/s	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108					*	c	5.4
109					*	c	3.5
110						n/s	7.5
111				*		c	5.8
112					*	g	2.5
113					*	e	3.2
114				*		e	1.3
115				*		e	2.9
116				*		g	2.5
117				*		e	3.4
118				*		g	1.2
Contracts	13	16	18	26	31	104	88.1 ⁺⁺
Miles	40.9	69.7	94.5	115	126.4	446.5	84.7 ⁺⁺⁺

Note: * - indicates the year the sections would be resurfaced
+ - see Table 7.5 for resurfacing activity code
n/s - contract section not selected for resurfacing
++ - indicates percent of contracts that would be resurfaced
+++ - indicates percent of miles that would be resurfaced

Table D.8 Results from Roughness Reduction Model for Budget Scenario 3:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2					*	c	5.8
3			*			c	7.1
4		*				c	3.7
5			*			c	6.1
6				*		c	6.4
7			*			e	5.1
8			*			c	6.0
9			*			c	3.7
10			*			c	4.1
11			*			c	4.4
12					*	c	3.6
13			*			c	4.4
14		*				c	3.7
15						n/s	5.1
16			*			c	6.4
17				*		c	6.1
18		*				c	3.7
19		*				e	4.5
20	*					c	2.9
21	*					c	6.2
22				*		c	7.8
23	*					e	5.3
24						n/s	4.1

Table D.8 Results from Roughness Reduction Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
25				*		c	5.7
26						n/s	5.2
27					*	c	4.4
28				*		c	5.5
29				*		c	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33					*	e	7.3
34	*					e	0.7
35					*	e	6.6
36		*				c	3.5
37			*			a	5.3
38				*		e	6.6
39	*					c	2.7
40						n/s	5.8
41	*					c	2.7
42	*					e	3.2
43				*		e	5.8
44				*		e	4.0
45				*		e	4.4
46	*					c	2.2
47				*		c	3.7
48	*					c	2.7

Table D.8 Results from Roughness Reduction Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
49				*		c	5.3
50			*			c	3.1
51			*			c	5.3
52					*	c	4.2
53	*					c	1.7
54	*					e	4.4
55					*	e	4.0
56				*		e	5.8
57				*		e	4.5
58		*				e	6.4
59			*			e	5.3
60			*			c	9.2
61		*				c	6.4
62		*				c	6.9
63				*		c	6.4
64	*					c	0.4
65					*	c	9.2
66		*				c	5.3
67		*				e	6.4
68		*				e	4.5
69	*					g	2.5
70					*	e	3.7
71					*	e	1.6
72				*		e	3.2

Table D.8 Results from Roughness Reduction Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73					*	c	1.2
74						n/s	5.5
75					*	c	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79					*	c	1.4
80			*			e	2.5
81					*	e	1.4
82						n/s	5.4
83					*	c	3.6
84						n/s	5.1
85					*	c	3.7
86						n/s	4.1
87					*	e	4.0
88					*	e	4.4
89					*	c	3.6
90					*	a	3.7
91					*	c	4.1
92					*	e	4.0
93						n/s	3.3
94						n/s	6.6
95						n/s	5.8
96		*				e	0.7

Table D.8 Results from Roughness Reduction Model for Budget Scenario 3:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
97						n/s	7.3
98					*	e	3.7
99						n/s	6.6
100						n/s	4.8
101					*	e	0.7
102						n/s	7.3
103					*	c	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109				*		c	3.5
110						n/s	7.5
111				*		c	5.8
112					*	g	2.5
113					*	e	3.2
114						n/s	1.3
115				*		e	2.9
116				*		g	2.5
117					*	e	3.4
118			*			g	1.2
Contracts	14	13	17	21	30	95	80.5 ++
Miles	39.6	61.5	83.8	105.5	112.1	402.5	76.4 +++

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

++ - indicates percent of contracts that would be resurfaced

+++ - indicates percent of miles that would be resurfaced

Table D.9 Results from Roughness Reduction Model for Budget Scenario 4:
Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
1			*			e	4.6
2		*				c	5.8
3			*			c	7.1
4	*					c	3.7
5				*		c	6.1
6				*		c	6.4
7			*			e	5.1
8				*		c	6.0
9				*		c	3.7
10				*		c	4.1
11				*		c	4.4
12						n/s	3.6
13			*			c	4.4
14		*				c	3.7
15				*		c	5.1
16			*			c	6.4
17					*	c	6.1
18		*				c	3.7
19		*				e	4.5
20	*					c	2.9
21	*					c	6.2
22				*		c	7.8
23	*					e	5.3
24				*		c	4.1

Table D.9 Results from Roughness Reduction Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
25					*	c	5.7
26					*	c	5.2
27						n/s	4.4
28					*	c	5.5
29					*	a	4.4
30		*				e	5.8
31	*					e	2.0
32						n/s	4.8
33					*	e	7.3
34	*					e	0.7
35					*	e	6.6
36		*				c	3.5
37						n/s	5.3
38						n/s	6.6
39		*				c	2.7
40						n/s	5.8
41	*					c	2.7
42	*					e	3.2
43				*		e	5.8
44					*	e	4.0
45					*	e	4.4
46	*					c	2.2
47			*			c	3.7
48	*					c	2.7

Table D.9 Results from Roughness Reduction Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
49				*		c	5.3
50				*		c	3.1
51			*			c	5.3
52					*	c	4.2
53	*					c	1.7
54	*					e	4.4
55						n/s	4.0
56				*		e	5.8
57					*	e	4.5
58		*				e	6.4
59				*		e	5.3
60			*			c	9.2
61		*				c	6.4
62			*			c	6.9
63					*	c	6.4
64	*					c	0.4
65						n/s	9.2
66		*				c	5.3
67			*			e	6.4
68			*			e	4.5
69	*					g	2.5
70						n/s	3.7
71					*	e	1.6
72					*	e	3.2

Table D.9 Results from Roughness Reduction Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity ⁺	Section Length
	1982	1983	1984	1985	1986		
73						n/s	1.2
74						n/s	5.5
75						n/s	4.4
76				*		c	5.2
77					*	e	1.7
78					*	c	3.3
79					*	c	1.4
80				*		e	2.5
81					*	e	1.4
82						n/s	5.4
83						n/s	3.6
84						n/s	5.1
85						n/s	3.7
86						n/s	4.1
87						n/s	4.0
88					*	e	4.4
89						n/s	3.6
90					*	a	3.7
91						n/s	4.1
92						n/s	4.0
93						n/s	3.3
94						n/s	6.6
95						n/s	5.8
96		*				e	0.7

Table D.9 Results from Roughness Reduction Model for Budget Scenario 4:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
97						n/s	7.3
98						n/s	3.7
99						n/s	6.6
100						n/s	4.8
101					*	e	0.7
102						n/s	7.3
103						n/s	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109				*		c	3.5
110						n/s	7.5
111					*	c	5.8
112						n/s	2.5
113					*	e	3.2
114				*		e	1.3
115				*		e	2.9
116				*		g	2.5
117					*	e	3.4
118			*			g	1.2
Contracts	14	11	12	20	24	81	68.6 ++
Miles	40.6	48.5	64.8	90.9	98.1	342.9	65.1 +++

Note: * - indicates the year the sections would be resurfaced
+ - see Table 7.5 for resurfacing activity code
n/s - contract section not selected for resurfacing
++ - indicates percent of contracts that would be resurfaced
+++ - indicates percent of miles that would be resurfaced

Table D.10 Results from Roughness Reduction Model for Budget Scenario 5: Interstate Highway System

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
1				*		e	4.6
2						n/s	5.8
3			*			c	7.1
4	*					c	3.7
5				*		c	6.1
6					*	c	6.4
7			*			e	5.1
8				*		c	6.0
9			*			c	3.7
10				*		c	4.1
11					*	c	4.4
12						n/s	3.6
13					*	c	4.4
14		*				c	3.7
15					*	c	5.1
16			*			c	6.4
17				*		c	6.1
18			*			c	3.7
19		*				e	4.5
20	*					c	2.9
21	*					c	6.2
22				*		c	7.8
23	*					e	5.3
24					*	c	4.1

Table D.10 Results from Roughness Reduction Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity †	Section Length
	1982	1983	1984	1985	1986		
25						n/s	5.7
26						n/s	5.2
27						n/s	4.4
28					*	c	5.5
29						n/s	4.4
30			*			e	5.8
31	*					e	2.0
32						n/s	4.8
33					*	e	7.3
34	*					e	0.7
35						n/s	6.6
36			*			c	3.5
37						n/s	5.3
38					*	e	6.6
39		*				c	2.7
40						n/s	5.8
41	*					c	2.7
42	*					e	3.2
43				*		e	5.8
44						n/s	4.0
45						n/s	4.4
46	*					c	2.2
47				*		c	3.7
48	*					c	2.7

Table D.10 Results from Roughness Reduction Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity [†]	Section Length
	1982	1983	1984	1985	1986		
49					*	c	5.3
50					*	c	3.1
51				*		c	5.3
52						n/s	4.2
53	*					c	1.7
54	*					e	4.4
55						n/s	4.0
56					*	e	5.8
57						n/s	4.5
58		*				e	6.4
59			*			e	5.3
60				*		c	9.2
61		*				c	6.4
62		*				c	6.9
63					*	c	6.4
64	*					c	0.4
65						n/s	9.2
66		*				c	5.3
67			*			e	6.4
68		*				e	4.5
69	*					g	2.5
70						n/s	3.7
71					*	e	1.6
72			*			d	3.2

Table D.10 Results from Roughness Reduction Model for Budget Scenario 5:
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
73						n/s	1.2
74						n/s	5.5
75						n/s	4.4
76				*		c	5.2
77					*	e	1.7
78						n/s	3.3
79						n/s	1.4
80				*		e	2.5
81					*	e	1.4
82						n/s	5.4
83						n/s	3.6
84						n/s	5.1
85						n/s	3.7
86						n/s	4.1
87						n/s	4.0
88						n/s	4.4
89						n/s	3.6
90					*	a	3.7
91						n/s	4.1
92						n/s	4.0
93						n/s	3.3
94						n/s	6.6
95						n/s	5.8
96		*				e	0.7

Table D.10 Results from Roughness Reduction Model for Budget Scenario 5.
Interstate Highway System (Continued)

Section (coded)	Calendar Year					Resurfacing Activity +	Section Length
	1982	1983	1984	1985	1986		
97						n/s	7.3
98						n/s	3.7
99						n/s	6.6
100						n/s	4.8
101					*	e	0.7
102						n/s	7.3
103						n/s	3.7
104						n/s	6.3
105						n/s	5.3
106						n/s	6.0
107						n/s	5.8
108						n/s	5.4
109				*		c	3.5
110						n/s	7.5
111					*	c	5.8
112					*	g	2.5
113						n/s	3.2
114				*		e	1.3
115				*		e	2.9
116					*	g	2.5
117						n/s	3.4
118			*			g	1.2
Contracts	14	9	11	15	20	69	58.5 ++
Miles	40.6	41.1	51.4	74.1	84.3	291.5	55.3 +++

Note: * - indicates the year the sections would be resurfaced

+ - see Table 7.5 for resurfacing activity code

n/s - contract section not selected for resurfacing

++ - indicates percent of contracts that would be resurfaced

+++ - indicates percent of miles that would be resurfaced

Appendix E
Listing of Computer Program

Description of Preoptimization Computer Program

A computer program called "Preopt.f" has been written in FORTRAN to be used prior to the optimization program. The purpose of this computer program is to get the data pertaining to the pavement sections identified as deficient and arrange them in a suitable manner to be used by the optimization program. These data include:

- roughness number
- increase in roughness number
- pavement condition
- pavement age
- directional ADT
- accumulated ADT
- traffic growth

Other parameters input to the program include:

- pavement resurfacing cost
- routine maintenance cost
- different resurfacing activities
- budget estimates for each calendar year

Relative weights for each performance factor are also input to the program to compute the objective function coefficients.

The equivalent performance curves described in Chapter 3 are input to the program in nine data statements one for each performance curve. Different performance curves have been developed for asphalt, concrete pavements, and continuously reinforced concrete pavements.

The pavement contract section is the unit of measurement used as input to the program. Northbound and southbound lanes as well as east and westbound lanes were considered as different pavement contract sections.

In the preparation of the input file for the program it is recommended to enter first those contract sections which are known to be in greatest need of major rehabilitation for example, 1982 deficient pavement sections should be input first, then 1983 sections and so on.

The program, in its present form, is formulated for a five year analysis period.

```

c      program Preopt
c
c      This program is located on      /o/colucci/ch7.runs/Preopt.f
c
c      parameter(myear=5)
c      parameter (nalt=7)
c      parameter (n=13)
c      parameter(nsect1=70)
c      parameter (nsect2=48)
c      parameter(nsect=118)
c
c      dimension route(nsect)
c      real y(n), xrndai(n),xrndci(n),xrncrc(n),xrnaci(n),
c      *xrnci(n),xrcrd(n),xrnacs(n),xrncs(n),xageci(n),xagei(n)
c      real rnepi1(nsect),ageep1(nsect),coef(nsect),depi(nsect)
c      integer a(nsect,nalt)
c      real len(nsect),ared(nsect,nalt)
c      integer contr(nsect),code(nsect),yr(nsect),secno(nsect)
c      real adt(nsect),age(nsect),rn(nsect),tadt(nsect)
c      real rn81(nsect1),rn80(nsect1),rn79(nsect1),delta(nsect)
c      real rn1(nsect2),rn2(nsect2)
c      real pt(nsect1),pci(nsect),clen(nsect1),nyear(nsect),agr(nsect)
c
c      character*7 route
c
c
c      call intro
c
c
c      call system("rm year1.data")
c      call system("rm year2.data year3.data year4.data year5.data")
c      call system("rm object.cof budget.cof ")
c      call system("rm input.model")
c
c      open(unit=11,file="model.data",status="old",form="formatted")
c      rewind(unit=11)
c      open(unit=4,file="year1.data",status="new",form="formatted")
c      rewind(unit=4)
c      open(unit=7,file="year2.data",status="new",form="formatted")
c      open(unit=8,file="year3.data",status="new",form="formatted")
c      open(unit=9,file="year4.data",status="new",form="formatted")
c      open(unit=10,file="year5.data",status="new",form="formatted")
c      rewind(unit=7)
c      rewind(unit=8)
c      rewind(unit=9)
c      rewind(unit=10)
c
c      ** names of files used throughout this program are listed below **
c      model.data-input data files with all the contract sections.
c      year1.data-input data for year 1.
c      year2.data-input data for year 2.
c      year3.data-input data for year 3.
c      year4.data-input data for year 4.
c      year5.data-input data for year 5.
c      budget.cof-are the budget coefficients for the formulation

```

```

c      object.cof-objective function coefficients for new sections,yr2-5
c      decision.var-decision variables (string format).
c      input.model=contains the input model formulation
c
c      data (xrndai(i),i=1,12) /0.,35.,95.,135.,170.,200.,215.,240.,295.,
*400.,530.,750./
c      data (y(i),i=1,13)/ 100.,90.,80.,70.,60.,50.,40.,30.,20.,10.,5.,1.
*0./
c      data (xrndci(i),i=1,13)/0.,30.,60.,90.,120.,152.,190.,240.,310.,
*430.,545.,750.,975./
c      data (xrncrc(i),i=1,13)/900.,1140.,1300.,1400.,1520.,1660.,1720.,
*1750.,1850.,2020.,2100.,2200.,10000./
c      data (xrnci(i),i=1,13)/300.,400.,490.,560.,605.,650.,680.,740.,
*840.,1000.,1140.,1500.,10000./
c      data (xrnci(i),i=1,13)/700.,1060.,1260.,1440.,1580.,1710.,1820.,
*1970.,2160.,2400.,2600.,3200.,10000./
c      data (xcrcd(i),i=1,13)/0.,25.,47.,65.,80.,100.,130.,165.,200.,
*270.,475.,650.,900./
c      data (xrncs(i),i=1,13)/300.,600.,775.,975.,1175.,1400.,1750.,
*2075.,2160.,3000.,3525.,4500.,10000./
c      data (xrncs(i),i=1,13)/400.,700.,825.,900.,1040.,1200.,1500.,
*1600.,1750.,1975.,2200.,2700.,10000./
c      data (xageci(i),i=1,13)/2.,7.,9.5,11.,12.5,13.5,14.5,15.,16.5,
*18.5,20.5,24.,30./
c      data (xagei(i),i=1,13)/0.,1.,2.,2.5,3.2,3.8,4.5,5.,5.5,7.,8.5,
*12.,15./
c
c      do 100 i=1,nsect
c
c          if(i.le.nsect1)then
c              read(11,110) pt(i),adt(i),rn(1),age(i),pci(i),c1en(i),
* (a(i,j),j=1,nalt),rn81(i),rn80(i),rn79(i),contr(i),route(i)
c
c110  format(f1.0,1x,f5.0,1x,f4.0,1x,f2.0,1x,f2.0,1x,f3.0,7(1x,11)
* ,1x,3(f4.0,1x),15,1x,a7)
c
c          delta(i)=abs(rn(i)-rn81(i))
c          print *,i,delta(i)
c          secno(i)=1
c          yr(i)=1982
c          agr(i)=rn(1)/rn81(i)
c          if (agr(i) .le. 1.00)then
c              agr(i)=1.00
c          endif
c          print *,i,'agr=',agr(i),'delta=',delta(i)
c          len(i)=c1en(i)/10.
c          if(pt(i).eq.1.)then
c              code(i)=253
c          elseif((pt(i).eq.2.).or.(pt(i).eq.3.))then
c              code(i)=252
c          endif

```

```

elseif((i.gt.nsect1).and.(i.le.nsect))then
  read(11,120) route(i),contr(i),len(i),code(i),adt(i)
*,age(i),rn(i),yr(i),(a(i,j),j=1,nalt),secno(i),rn1(i-nsect1)
*,rn2(i-nsect1)
c
120 format(a7,1x,i5,1x,f3.1,1x,i3,1x,f5.0,1x,f2.0,2x,f4.0,2x,i4,3x
*,7(i1,2x),i3,2(1x,f4.0))
c
  delta(i)=abs(rn(i)-rn2(i-nsect1))
  agr(i)=rn(i)/rn2(i-nsect1)
  if(agr(i).le. 1.00)then
    agr(i)=1.00
  endif
  print *,i,'agr=',agr(i),'delta=',delta(i)
  pci(i)=0.0
  print *,i,delta(i)
c
c   print *, route(i),contr(i),len(i),code(i),adt(i),age(i),rn(i),
c   *yr(i),(a(i,j),j=1,7),secno(i)
c   print *,route(i),contr(i),secno(i)
c   endif
100 continue
c
  call totadt(adt,age,tadt,yr)
c
  do 30 i=1,nsect
    if((code(i).eq.261).or.(code(i).eq.262).or.(code(i).eq.251).or.
*(code(i).eq.252))then
      call intp(xrnci,y,rn,rnepii,i)
      print *,i,rn(i),rnepii(i)
c
      call intp(xageci,y,age,ageepi,i)
      if(delta(i).gt.xrndci(11)) delta(i)=xrndci(11)
      if(delta(i).lt.xrndci(2))delta(i)=xrndci(2)
      call intp(xrndci,y,delta,depi,i)
      call cswd(tadt,rnepii,depi,ageepi,pci,coef,i)
      elseif((code(i).eq.253).or.(code(i).eq.263))then
        call intp(xrncrc,y,rn,rnepii,i)
        print *,i,rn(i),rnepii(i)
c
        call intp(xageci,y,age,ageepi,i)
        if(delta(i).gt.xcrdc(11)) delta(i)=xcrdc(11)
        if(delta(i).lt.xcrdc(2)) delta(i)=xcrdc(2)
        call intp(xcrdc,y,delta,depi,i)

```

```

        call cswd(tadt,rnepii,depi,ageepi,pci,coef,i)
    endif
30    continue
c    do 40 i=1,nsect
c    print *, i,adt(i),rn(i),rnepii(i),age(i),ageepi(i),coef(i)
c40    continue
c
        call objcof(a,coef,ared,yr,nyear,rn,agr)
c
    n1=0
    n2=0
    n3=0
    n4=0
    n5=0
    do 50 i=1,nsect
        if(yr(i).eq.1982)then
            n1=n1+1
            write(4,55) route(i),contr(i),len(i),code(i),adt(i),
*age(i),rn(i),yr(i),(a(i,j),j=1,7),secno(i),delta(i)
55    format(a7,lx,i5,lx,f3.1,lx,i3,lx,f6.0,lx,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,lx,f5.0)
            elseif(yr(i).eq.1983)then
                n2=n2+1
                write(7,60) route(i),contr(i),len(i),code(i),adt(i),
*age(i),rn(i),yr(i),(a(i,j),j=1,7),secno(i),delta(i)
60    format(a7,lx,i5,lx,f3.1,lx,i3,lx,f6.0,lx,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,lx,f5.0)
                elseif(yr(i).eq.1984)then
                    n3=n3+1
                    write(8,70) route(i),contr(i),len(i),code(i),adt(i),
*age(i),rn(i),yr(i),(a(i,j),j=1,7),secno(i),delta(i)
70    format(a7,lx,i5,lx,f3.1,lx,i3,lx,f6.0,lx,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,lx,f5.0)
                    elseif(yr(i).eq.1985)then
                        n4=n4+1
                        write(9,80) route(i),contr(i),len(i),code(i),adt(i),
*age(i),rn(i),yr(i),(a(i,j),j=1,7),secno(i),delta(i)
80    format(a7,lx,i5,lx,f3.1,lx,i3,lx,f6.0,lx,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,lx,f5.0)
                        elseif(yr(i).eq.1986)then
                            n5=n5+1
                            write(10,90) route(i),contr(i),len(i),code(i),adt(i)
*age(i),rn(i),yr(i),(a(i,j),j=1,7),secno(i),delta(i)
90    format(a7,lx,i5,lx,f3.1,lx,i3,lx,f6.0,lx,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,lx,f5.0)
                            endif
50    continue
c
        close(unit=4)
        close(unit=7)
        close(unit=8)
        close(unit=9)
        close(unit=10)
        close(unit=11)

```

```

c      open(unit=2,file="budget.cof",status="new",form="formatted")
*      rewind(unit=2)
c
c      jcount=0
c      .... year 1 budget coefficients ....
call budcof(jcount,n1,n2,n3,n4,n5,1,82,1,0)
c      .... year 2 budget coefficients ....
call budcof(jcount,n1,n2,n3,n4,n5,2,82,1,2)
call budcof(jcount,n1,n2,n3,n4,n5,1,83,2,0)
c      .... year 3 budget coefficients ....
call budcof(jcount,n1,n2,n3,n4,n5,2,82,2,3)
call budcof(jcount,n1,n2,n3,n4,n5,2,83,2,3)
call budcof(jcount,n1,n2,n3,n4,n5,1,84,3,0)
c      .... year 4 budget coefficients ....
call budcof(jcount,n1,n2,n3,n4,n5,2,82,3,4)
call budcof(jcount,n1,n2,n3,n4,n5,3,83,3,0)
call budcof(jcount,n1,n2,n3,n4,n5,3,84,3,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,83,4,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,84,4,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,85,4,0)
c      .... year 5 budget coefficients ....
call budcof(jcount,n1,n2,n3,n4,n5,2,82,4,5)
call budcof(jcount,n1,n2,n3,n4,n5,3,83,4,0)
call budcof(jcount,n1,n2,n3,n4,n5,3,84,4,0)
call budcof(jcount,n1,n2,n3,n4,n5,3,85,4,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,83,5,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,84,5,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,85,5,0)
call budcof(jcount,n1,n2,n3,n4,n5,1,86,5,0)
c
c      close(unit=2)
c
c      call string
c
c      call model
c
c      call messg(5)
c
c      stop
c      end

```

```

subroutine intro

c
character*1 answer
c
call insert(2)

c
c (*-----*)
c (*
c (*
c (*
c (*      PRE-OPTIMIZATION PROGRAM
c (*
c (*
c (*      preopt.f
c (*
c (*
c (*
c (*      by
c (*
c (*
c (*      Benjamin Colucci-Rios
c (*
c (*      Purdue University
c (*
c (*      May 1, 1984
c (*
c (*-----*)
c
c
c      write(6,100)
100  format('The purpose of the preopt.f computer program is to'//
*combine all the performance information of roughness, adt,'//
*pavement age, and pavement condition index for all pavement'//
*sections considered deficient during the analysis period into'//
*a master file which can be used to generate the coefficients'//
*for the optimization model described in Chapter 6.'//)

c
call insert(1)

c
print *, 'Type "c" to continue, otherwise type "q" to quit'
read(5,*) answer
if(answer .eq. 'q') go to 999
do 900 i=1,25
print *
900  continue

c
c
c      write(6,150)
150  format('The current version performs the following operations:'//
*1. Generates the equivalence performance indices corresponding'//
*to roughness, change in roughness, pavement age for'//
*jointed reinforced, cont. reinforced and asphalt pavements.'//
*The development of these curves is explained in Chapter 3.'//
*2. Generates the percent reduction in pavement distresses for'//
*each section based upon the resurfacing strategy assigned'//
*to them.'//
*The methodology is explained in Chapter. 5'//)

c
c
c      call insert(1)

c
print *, 'Type "c" to continue, otherwise type "q" to quit'

```

```

        read(5,*) answer
        if(answer .eq. 'q') go to 999
c
        do 170 i=1,25
        print *
170    continue
c
        write(6,200)
200    format(' 3. Computes the contract section worth for each section'//
*' 4. Is user friendly, therefore, it accepts users information'//
*' as it executes the program.'//
*' The parameters that can be changed are:'//
*' a. The weights assigned to performance factors considered.'//
*' (i.e. roughness, change in roughness, pavement age, '//
*' pavement condition index.)'//
*' b. pavement resurfacing costs per center-line mi associated'//
*' with the resurfacing strategies considered.'//)
c
c
        call insert(1)
c
        print *, 'Type "c" to continue, otherwise type "q" to quit'
        read(5,*) answer
        if(answer .eq. 'q') go to 999
        do 910 i=1,25
        print *
910    continue
c
        write(6,300)
300    format('      c. Expected routine maintenance costs for sections'//
*          '      selected for resurfacing by optimization program'//
*          '      d. The right hand side coefficients, rhs, for budget'//
*          '      constraints - years 1 through 5 of the analysis'//
*          '      period.'//)
c
c
        call insert(1)
c
        print *, 'Type "c" to continue, otherwise type "q" to quit'
        read(5,*) answer
        if(answer .eq. 'q') go to 999
        do 350 i=1,25
        print *
350    continue
c
        write(6,400)
400    format(' e. The equivalence performance curves can be changed'//
*' in the data statements associated with'//
*' each pavement type and performance factor combination.'//)
c
c
        call insert(1)
c
c
        print *, 'Type "c" to continue. otherwise type "q" to quit'
        read(5,*) answer
        if(answer .eq. 'q') go to 999
999    return
end

```

```

subroutine budcof(jcount,n1,n2,n3,n4,n5,icode,iyear,j1,j2)
c
  parameter(nalt=7)
  parameter(ia=70)
  parameter(c=100000.)
  parameter(myyear=5)
  parameter(bint=1.06)
c
  dimension route(ia)
  real cosij1(ia,myyear),acost(nalt),armc(nalt)
  real cosij2(ia,myyear),cosij3(ia,myyear),cosij4(ia,myyear),
* cosij5(ia,myyear),cosij6(ia,myyear),cosij7(ia,myyear)
  real len(ia),adt(ia),age(ia),rn(ia),delta(ia)
  real cost(ia,nalt),costf1(ia,myyear),rutine(ia,nalt),
* costf2(ia,myyear),costf3(ia,myyear),costf4(ia,myyear),
* costf5(ia,myyear),costf6(ia,myyear),costf7(ia,myyear)
  integer contr(ia),code(ia),yr(ia),secno(ia),nyear(ia)
  integer a(ia,nalt)
  character*7 route
  character*1 answer
c
c
c .... Interactive version used to enter pavement resurfacing costs ....
c
  jcount=jcount+1
c
  if(jcount .eq. 1) then
c
    do 997 i=1,25
      print *
997    continue
c
    print *, 'The pavement resurfacing costs used in this model are:'
    print *, '      ($/center-line mile)'
c
    acost(1)=310000.
    acost(2)=345000.
    acost(3)=371000.
    acost(4)=393000.
    acost(5)=412000.
    acost(6)=429000.
    acost(7)=445000.
c
    do 900 i=1,nalt
      print *
      print *, '    Alt #',i,':',acost(i)
900    continue
c
    call insert(1)

```

```

        print *, 'Do you want to use other resurfacing costs (y/n)?'
c
        read(5,*) answer
c
        if(answer.eq.'y')then
c
        do 920 i=1,nalt
        print *
        print *, 'Enter new resurfacing cost figure for alternative',i,':'
c
                if(i.eq.1)then
                print *, '(f10.1 format required):'
                endif
c
        read(5,*) acost(i)
        print *
920    continue
c
c
        endif
c
c ..... Interactive version used to enter routine maintenance costs ....
        call insert(2)
c
        print *, 'The pavement routine maintenance costs used herein are:'
        print *, '          ($/center-line mile)'
c
        armc(1)=900.
        armc(2)=765.
        armc(3)=635.
        armc(4)=500.
        armc(5)=365.
        armc(6)=235.
        armc(7)=105.
c
        do 950 i=1,nalt
        print *
        print *, 'Alt #',i,':',armac(i)
950    continue
c
        call insert(1)
        print *, 'Do you want to use other maintenance figures (y/n)?'
c
        read(5,*) answer
c
        if(answer.eq.'y')then
c
        do 960 i=1,nalt
        print *, 'Enter routine maintenance cost for alternative',i,':'
                if(i.eq.1)then
                print *, '(f10.1 format required)'
                endif
c
        read(5,*) armc(i)
        print *
960    continue
c
c
        endif
c
        endif

```

```

c
    if (iyear.eq.82)then
        icount=n1
        open(unit=1,file="year1.data",status="old",form="formatted")
        rewind(unit=1)
        elseif (iyear.eq.83)then
            icount=n2
            open(unit=1,file="year2.data",status="old",form="formatted")
            rewind(unit=1)
            elseif (iyear.eq.84)then
                icount=n3
                open(unit=1,file="year3.data",status="old",form="formatted")
                rewind(unit=1)
                elseif (iyear.eq.85)then
                    icount=n4
                    open(unit=1,file="year4.data",status="old",form="formatted")
                    rewind(unit=1)
                    elseif (iyear.eq.86)then
                        icount=n5
                        open(unit=1,file="year5.data",status="old",form="formatted")
                        rewind(unit=1)
                    endif
c
c *****
c
c
c
    if(iyear.eq.82)then
        do 6 i=1,icount
            read(1,7) route(i),contr(i),len(i),code(i),adt(i),age(i),rn(i),
*yr(i),(a(i,j),j=1,7),secno(i),delta(i)
7      format(a7,1x,i5,1x,f3.1,1x,i3,1x,f6.0,1x,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,1x,f5.0)
            nyear(i)=1987-yr(i)
6      continue
        else
            do 2 i=1,icount
                read(1,5) route(i),contr(i),len(i),code(i),adt(i),age(i),rn(i),
*yr(i),(a(i,j),j=1,7),secno(i),delta(i)
5      format(a7,1x,i5,1x,f3.1,1x,i3,1x,f6.0,1x,f3.0,2x,f5.0,2x,i4,3x,
*7(i1,2x),i3,1x,f5.0)
            nyear(i)=1987-yr(i)
2      continue
    endif
c
c *****;

```

```

do 199 i=1,icount
cost(1,1)=acost(1)
cost(1,2)=acost(2)
cost(1,3)=acost(3)
cost(1,4)=acost(4)
cost(1,5)=acost(5)
cost(1,6)=acost(6)
cost(1,7)=acost(7)
routine(1,1)=armc(1)
routine(1,2)=armc(2)
routine(1,3)=armc(3)
routine(1,4)=armc(4)
routine(1,5)=armc(5)
routine(1,6)=armc(6)
routine(1,7)=armc(7)
199 continue

c
if(icode.eq.1)then
c
j=j1
do 1000 i=1,icount
if(a(i,1).eq.1.)then
costf1(i,j)=((cost(i,1)+routine(i,1))*(bint**j)*len(i))/c
costf2(i,j)=((cost(i,2)+routine(i,2))*(bint**j)*len(i))/c
costf3(i,j)=((cost(i,3)+routine(i,3))*(bint**j)*len(i))/c
40 write(2,40) i,costf1(i,j),costf2(i,j),costf3(i,j)
format(1x,i2,3(3x,f15.3))
elseif(a(i,3).eq.1.)then
costf3(i,j)=((cost(i,3)+routine(i,3))*(bint**j)*len(i))/c
costf4(i,j)=((cost(i,4)+routine(i,4))*(bint**j)*len(i))/c
costf5(i,j)=((cost(i,5)+routine(i,5))*(bint**j)*len(i))/c
write(2,40) i,costf3(i,j),costf4(i,j),costf5(i,j)
elseif(a(i,5).eq.1.)then
costf5(i,j)=((cost(i,5)+routine(i,5))*(bint**j)*len(i))/c
costf6(i,j)=((cost(i,6)+routine(i,6))*(bint**j)*len(i))/c
costf7(i,j)=((cost(i,7)+routine(i,7))*(bint**j)*len(i))/c
write(2,40) i,costf5(i,j),costf6(i,j),costf7(i,j)
endif
1000 continue
c
elseif(icode.eq.2)then
c
j=j1
do 2100 i=1,icount
if(a(i,1).eq.1)then
cosij1(i,j)=-((cost(i,1)*(bint**j)*len(i))/c)
cosij2(i,j)=-((cost(i,2)*(bint**j)*len(i))/c)
cosij3(i,j)=-((cost(i,3)*(bint**j)*len(i))/c)
write(2,40) i,cosij1(i,j),cosij2(i,j),cosij3(i,j)
elseif(a(i,3).eq.1)then
cosij3(i,j)=-((cost(i,3)*(bint**j)*len(i))/c)
cosij4(i,j)=-((cost(i,4)*(bint**j)*len(i))/c)
cosij5(i,j)=-((cost(i,5)*(bint**j)*len(i))/c)
write(2,40) i,cosij3(i,j),cosij4(i,j),cosij5(i,j)

```

```

elseif(a(i,5).eq.1)then
  cosij5(i,j)=-((cost(i,5)*(bint**j)*len(i))/c)
  cosij6(i,j)=-((cost(i,6)*(bint**j)*len(i))/c)
  cosij7(i,j)=-((cost(i,7)*(bint**j)*len(i))/c)
  write(2,40) i,cosij5(i,j),cosij6(i,j),cosij7(i,j)
endif
2100 continue
c
  j=j2
  do 3000 i=1,icount
    if(a(i,1).eq.1.)then
      costf1(i,j)=((cost(i,1)+routine(i,1))*(bint**j)*len(i))/c
      costf2(i,j)=((cost(i,2)+routine(i,2))*(bint**j)*len(i))/c
      costf3(i,j)=((cost(i,3)+routine(i,3))*(bint**j)*len(i))/c
      write(2,40) i,costf1(i,j),costf2(i,j),costf3(i,j)
    elseif(a(i,3).eq.1.)then
      costf3(i,j)=((cost(i,3)+routine(i,3))*(bint**j)*len(i))/c
      costf4(i,j)=((cost(i,4)+routine(i,4))*(bint**j)*len(i))/c
      costf5(i,j)=((cost(i,5)+routine(i,5))*(bint**j)*len(i))/c
      write(2,40) i,costf3(i,j),costf4(i,j),costf5(i,j)
    elseif(a(i,5).eq.1) then
      costf5(i,j)=((cost(i,5)+routine(i,5))*(bint**j)*len(i))/c
      costf6(i,j)=((cost(i,6)+routine(i,6))*(bint**j)*len(i))/c
      costf7(i,j)=((cost(i,7)+routine(i,7))*(bint**j)*len(i))/c
      write(2,40) i,costf5(i,j),costf6(i,j),costf7(i,j)
    endif
  3000 continue
c
  elseif(icode.eq.3)then
c
  j=j1
  do 5100 i=1,icount
    if(a(i,1).eq.1)then
      cosij1(i,j)=-((cost(i,1)*(bint**j)*len(i))/c)
      cosij2(i,j)=-((cost(i,2)*(bint**j)*len(i))/c)
      cosij3(i,j)=-((cost(i,3)*(bint**j)*len(i))/c)
      write(2,40) i,cosij1(i,j),cosij2(i,j),cosij3(i,j)
    elseif(a(i,3).eq.1)then
      cosij3(i,j)=-((cost(i,3)*(bint**j)*len(i))/c)
      cosij4(i,j)=-((cost(i,4)*(bint**j)*len(i))/c)
      cosij5(i,j)=-((cost(i,5)*(bint**j)*len(i))/c)
      write(2,40) i,cosij3(i,j),cosij4(i,j),cosij5(i,j)
    elseif(a(i,5).eq.1) then
      cosij5(i,j)=-((cost(i,5)*(bint**j)*len(i))/c)
      cosij6(i,j)=-((cost(i,6)*(bint**j)*len(i))/c)
      cosij7(i,j)=-((cost(i,7)*(bint**j)*len(i))/c)
      write(2,40) i,cosij5(i,j),cosij6(i,j),cosij7(i,j)
    endif
  5100 continue
c
  endif
c
  close(unit=1)
  call flush(2)
c
  return
end

```

```

      subroutine intp(xvecto,yvecto,xvalue,yvalue,k)
c
      parameter(nsect=118)
      parameter(n=13)
      real xvecto(n),yvecto(n)
      real xvalue(nsect)
      real yvalue(nsect)
      do 10 i=1,n-1
      if (xvalue(k) .lt. xvecto(1)) then
      print *, 'xvalue is smaller than xvector lower bound'
      print *,i,xvalue(k),xvecto(1),k
      stop
      else if (xvalue(k) .gt. xvecto(n)) then
      print *, 'xvalue is larger than xvector upper bound'
      print *,i,xvalue(k),xvecto(n),k
      stop
      else if (xvalue(k) .eq. xvecto(i)) then
      yvalue(k) = yvecto(i)
      go to 999
      else if (xvalue(k) .eq. xvecto(i + 1)) then
      yvalue(k)=yvecto(i+1)
      go to 999
      else if((xvalue(k) .gt. xvecto(i)) .and. (xvalue(k) .lt.
      *xvecto(i + 1))) then
      zr = (yvecto(i+1)-yvecto(i))
      zr=zr*((xvalue(k)-xvecto(i))/(xvecto(i+1)-xvecto(i)))
      yvalue(k)=yvecto(i)+zr
      go to 999
      endif
10    continue
      print *, 'xvalue is wrong'
      stop
999   return
      end

c
      subroutine cswd(adt,rn,delta,age,pci,coef,i)
c
c subroutine cswd is used to compute the contract section worth.
c coef is the variable used to represent the contract section worth,csw
c change in roughness number is represented as delta.
c summation adt is expressed as tadt.
c pavement condition index (pci) is not included for years 2 through 5.
c
      parameter(nsect1=70)
      parameter(nsect2=48)
      parameter(nsect=118)
      character*1 answer
c
      real adt(nsect),rn(nsect),age(nsect),pci(nsect1),coef(nsect)
      real delta(nsect)
c      data w1,w2,w3,w4 /.40,.10,.30,.20/

```

```

c
c w1 is the weight assigned to roughness number readings
c w2 is the weight assigned to pavement age
c w3 is the weight assigned to pavement condition index
c w4 is the weight assigned to change in roughness number
c w5 is the weight assigned to roughness number for years 2 through 5
c w6 is the weight assigned to pavement age for years 2 through 5
c w7 is the weight assigned to change in roughness for years 2 through 5
c
      if(i.eq.1)then
        call insert(2)
c
c .... Interactive version used to change relative weights ...
c
      print *
      print *, 'The weights assigned to performance factors are:'
      print *
c
      w1=.40
      w2=.10
      w3=.30
      w4=.20
      w5=.50
      w6=.15
      w7=.35
c
      print *
      print *, '-----'
      print *, 'applicable year:      1st          2nd-5th'
      print *, '-----'
      print *, 'roughness           : ', w1, w5
      print *, 'pavt. age          : ', w2, w6
      print *, 'pci                : ', w3
      print *, 'delta rn           : ', w4, w7
      print *, '-----'
      print *
      call insert(1)
      print *, 'Do you want to change the weights(y/n)?'
c
      read(5,*) answer
c
      if(answer .eq. 'y')then
c
      print *
      print *, 'Enter roughness number weight for year 1:'
      read(5,*) w1
      print *
      print *, 'Enter roughness number weight for years 2 thru 5:'
      read(5,*) w5
      print *
      print *, 'Enter weight for pavement age for year 1:'
      read(5,*) w2
      print *

```

```

print *, 'Enter weight for pavement age-years 2 thru 5:'
read(5,*) w6
print *
print *, 'Enter weight for pavement condition index:'
read(5,*) w3
print *
print *, 'Enter weight for change in roughness-year 1:'
read(5,*) w4
print *
print *, 'Enter weight for change in roughness-year2 thru 5:'
read(5,*) w7
print *

c
      endif

c
      call messg(1)
      endif

c
      if (i.le.nsect1)then
c
      coef(i)=adt(i)*((100.-rn(i))*w1+(100.-age(i))*w2+
* (100.-pci(i))*w3+(100.-delta(i))*w4)

c
      print *, i, rn(i), w1, age(i), w2, pci(i), w3, adt(i), coef(i)
c
      print *, delta(i), w4
c
      elseif((i.gt.nsect1).and.(i.le.nsect))then
c
      coef(i)=adt(i)*((100.-rn(i))*w5+(100.-age(i))*w6+
* (100.-delta(i))*w7)

c
      print *, i, rn(i), w5, age(i), w6, adt(i), coef(i)
c
      print *, delta(i), w7
c
      endif

c
      return
      end

c
      subroutine objcof(a,coef,ared,yr,nyear,rn,agr)

c
      parameter(nsect=118)
      parameter(nalt=7)
      parameter(myyear=5)
      parameter(const=100.)

c
      character*1 answer
      real c11(nsect,myyear),c12(nsect,myyear),c13(nsect,myyear),
*c14(nsect,myyear),c15(nsect,myyear),c16(nsect,myyear),
*c17(nsect,myyear)
      integer a(nsect,nalt),yr(nsect),nyear(nsect)
      real ared(nsect,nalt),pctred(nalt)
      real coef(nsect)

```

```

      real rn(nsect),agr(nsect)
c
      open(unit=2,file="object.cof",status="new",form="formatted")
      rewind (unit=2)
c
      call messg(2)
      do 55 i=1,nsect
      do 60 j=1,nalt
      ared(i,j)=0.0
60      continue
55      continue
c
c .. Interactive version to enter percent reduction in pavement distress
      call insert(2)
c
      print *, 'Percent reduction values used:'
      print *
      pctred(1)=.6135
      pctred(2)=.6817
      pctred(3)=.7347
      pctred(4)=.7785
      pctred(5)=.8163
      pctred(6)=.8497
      pctred(7)=.8797
c
      do 900 i=1,nalt
      print *
      print *, '    Alt #',i,':',pctred(i)
900      continue
c
      call insert(1)
      print *
      print *, 'Do you want to change these factors (y/n)?'
c
      read(5,*) answer
      if(answer.eq.'y')then
      do 920 i=1,nalt
      print *
      print *, 'Enter % Reduction for Alt #',i,':'
      if(i.eq.1)then
      print *, '(f6.4 format required) :'
      endif
      read(5,*) pctred(i)
      print *
920      continue
      endif
c
      do 100 i=1,nsect
      if (a(i,1) .eq. 0 ) ared(i,1)=0.0
      if (a(i,1) .eq. 1 ) ared(i,1)=pctred(1)
      if (a(i,2) .eq. 0 ) ared(i,2)=0.0
      if (a(i,2) .eq. 1 ) ared(i,2)=pctred(2)

```

```

        if (a(i,3) .eq. 0 ) ared(i,3)=0.0
        if (a(i,3) .eq. 1 ) ared(i,3)=pctred(3)
        if (a(i,4) .eq. 0 ) ared(i,4)=0.0
        if (a(i,4) .eq. 1 ) ared(i,4)=pctred(4)
        if (a(i,5) .eq. 0 ) ared(i,5)=0.0
        if (a(i,5) .eq. 1 ) ared(i,5)=pctred(5)
        if (a(i,6) .eq. 0 ) ared(i,6)=0.0
        if (a(i,6) .eq. 1 ) ared(i,6)=pctred(6)
        if (a(i,7) .eq. 0 ) ared(i,7)=0.0
        if (a(i,7) .eq. 1 ) ared(i,7)=pctred(7)
100 continue
c
    do 500 i=1,nsect
        nyear(i)=1987-yr(i)
c
c ** computation of objective function coefficients
c for the basic model use the first set of equations
    do 200 j=1,nyear(i)
c        c11(i,j)=(coef(i)*(agr(i)**j)*ared(i,1)/const)
c        c12(i,j)=(coef(i)*(agr(i)**j)*ared(i,2)/const)
c        c13(i,j)=(coef(i)*(agr(i)**j)*ared(i,3)/const)
c        c14(i,j)=(coef(i)*(agr(i)**j)*ared(i,4)/const)
c        c15(i,j)=(coef(i)*(agr(i)**j)*ared(i,5)/const)
c        c16(i,j)=(coef(i)*(agr(i)**j)*ared(i,6)/const)
c        c17(i,j)=(coef(i)*(agr(i)**j)*ared(i,7)/const)
c
c for the roughness reduction model use the following equations:
        c11(i,j)=rn(i)*(agr(i)**j)*ared(i,1)
        c12(i,j)=rn(i)*(agr(i)**j)*ared(i,2)
        c13(i,j)=rn(i)*(agr(i)**j)*ared(i,3)
        c14(i,j)=rn(i)*(agr(i)**j)*ared(i,4)
        c15(i,j)=rn(i)*(agr(i)**j)*ared(i,5)
        c16(i,j)=rn(i)*(agr(i)**j)*ared(i,6)
        c17(i,j)=rn(i)*(agr(i)**j)*ared(i,7)
c
200 continue
500 continue
c
c ** objective function coefficients are stored in file object.cof **
c
    do 300 i=1,nsect
        do 400 j=1,nyear(i)
            if (c11(i,j) .ne. 0.) then
                write(2,320) i,j,c11(i,j),c12(i,j),c13(i,j)
c            print *, i,j,c11(i,j),c12(i,j),c13(i,j)
320         format(1x,i3,2x,i1,3(3x,f12.5))
            else if (c13(i,j) .ne. 0.) then
                write(2,330) i,j,c13(i,j),c14(i,j),c15(i,j)
c            print *, i,j,c13(i,j),c14(i,j),c15(i,j)
330         format(1x,i3,2x,i1,3(3x,f12.5))
            else if (c15(i,j) .ne. 0.) then
                write(2,340) i,j,c15(i,j),c16(i,j),c17(i,j)
c            print *, i,j,c15(i,j),c16(i,j),c17(i,j)
340         format(1x,i3,2x,i1,3(3x,f12.5))
            endif
        400 continue
    300 continue
c
    close(unit=2)
c
    return
end

```

```

c      subroutine model
c
c      parameter(nsect1=70)
c      parameter(nsect2=48)
c      parameter(nsect=118)
c      parameter(nyear=5)
c      parameter(naltf=3)
c      parameter(nobj=1241)
c      parameter(const=100000.)
c
c      dimension c(1458)
c      dimension xl(nobj),s1(nobj),x2(nobj),s2(nobj),x3(nobj),s3(nobj)
c      *,s4(nobj)
c      real a(nobj,naltf),rhs(nyear)
c      character max*3,st*10,c*32,end*3
c      character*1 answer
c      character*1 run
c      character*6 xl,x2,x3
c      character*1 s1,s2,s3,s4
c
c      open(unit=1,file="object.cof",status="old",form="formatted")
c      rewind(unit=1)
c      open(unit=2,file="decision.var",status="old",form="formatted")
c      rewind(unit=2)
c      open(unit=3,file="budget.cof",status="old",form="formatted")
c      rewind(unit=3)
c      open(unit=4,file="input.model",status="new",form="formatted")
c      rewind(unit=4)
c
c      ..... Interactive version used to enter budget coefficients ...
c
c      call insert(2)
c      print *, 'The budget figures (rhs) used in this model are:'
c
c      rhs(1)=170000000.
c      rhs(2)=320000000.
c      rhs(3)=460000000.
c      rhs(4)=600000000.
c      rhs(5)=750000000.
c
c      do 900 i=1,5
c      print *
c      print *, '      year',i,'=',rhs(i)
c
c      900 continue
c

```

```

call insert(1)
print *
print *, 'Do you want to use other figures (y/n)? '
c
  read(5,*) answer
  if(answer.eq.'y')then
    do 920 i=1,5
    print *
    print *, 'Enter budget for year', i, ':'
    if(i.eq.1)then
      print *, '(f10.1 format required) :'
    endif
    read(5,*) rhs(i)
    print *
920  continue
    endif
c
  call messg(4)
c
  print *, '..... objective function .....'
  call insert(1)
c
  do 10 i=1,453
  read(1,20) (a(i,j),j=1,nalrf)
20  format(7x,3(3x,f12.1))
10  continue
c
  read(2,30) max
30  format(a3)
c
  do 40 i=1,452
  read(2,50) x1(i),s1(i),x2(i),s2(i),x3(i),s3(i)
50  format(3(10x,a6,lx,a1))
40  continue
c
  read(2,51) x1(453),s1(453),x2(453),s2(453),x3(453)
51  format(2(10x,a6,lx,a1),10x,a6)
c
  write(4,60)max
60  format(a3)
c
  do 70 i=1,452
  write(4,80) a(i,1),x1(i),s1(i),a(i,2),x2(i),s2(i),a(i,3),x3(i),
*s3(i)
80  format(3(1x,f10.2,lx,a6,lx,a1))
70  continue
c
  write(4,81) a(453,1),x1(453),s1(453),a(453,2),x2(453),
*s2(453),a(453,3),x3(453)
81  format(2(1x,f8.2,lx,a6,lx,a1),lx,f8.2,lx,a6)
c
  print *, '..... budget constraints .....'
  call insert(1)

```

```

        read (2,120) st
        write(4,120) st
120    format(a10)

c
        print *, '... year 1 budget constraints ....'
        call insert(1)

c
        do 85 i=454,522
            read(2,86) x1(i),s1(i),x2(i),s2(i),x3(i),s3(i)
86        format(3(8x,a6,lx,a1))
85        continue

c
        read(2,87) x1(523),s1(523),x2(523),s2(523),x3(523),s3(523)
87        format(3(8x,a6,lx,a1))

c
        do 999 i=454,1241
            read(3,1000) (a(i,j),j=1,naltf)
1000        format(3x,3(3x,f15.3))
999        continue

c
        do 88 i=454,522
            write(4,89)a(i,1),x1(i),s1(i),a(i,2),x2(i),s2(i),a(i,3),x3(i),
            *s3(i)
89        format(3(lx,f15.3,lx,a6,lx,a1))
88        continue

c
        do 90 i=1,nyear
            rhs(i)=rhs(i)/const
90        continue

c
        write(4,91)a(523,1),x1(523),s1(523),a(523,2),
            *x2(523),s2(523),a(523,3),x3(523),s3(523),rhs(1)
91        format(3(lx,f15.3,lx,a6,lx,a1),lx,f10.1)

c
        print *, '... year 2 budget constraints ....'
        call insert(1)

c
        do 500 i=524,593
            read(2,510) x1(i),x2(i),x3(i)
510        format(3(8x,a6,lx))
500        continue

c
        do 520 i=524,593
            write(4,525) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
525        format(3(lx,f15.3,lx,a6))
520        continue

c
        do 530 i=594,662
            read(2,540)s1(i),x1(i),s2(i),x2(i),s3(i),x3(i)

```

```

540 format(3(lx,a1,8x,a6))
530 continue

c
    read(2,560)s1(663),x1(663),s2(663),x2(663),s3(663),x3(663),s4(663)
560 format(3(lx,a1,8x,a6),lx,a1)
c
    do 580 i=664,668
        read(2,590) x1(i),s1(i),x2(i),s2(i),x3(i),s3(i)
590 format(3(8x,a6,lx,a1))
580 continue

c
    read(2,591) x1(669),s1(669),x2(669),s2(669),x3(669),s3(669)
591 format(3(8x,a6,lx,a1))
c
    do 555 i=594,662
        write(4,556) s1(i),a(i,1),x1(i),s2(i),a(i,2),x2(i),s3(i),a(i,3),
        *x3(i)
556 format(3(lx,a1,lx,f15.3,lx,a6))
555 continue
        write(4,557) s1(663),a(663,1),x1(663),s2(663),a(663,2),x2(663),
        *s3(663),a(663,3),x3(663),s4(663)
557 format(3(lx,a1,lx,f15.3,lx,a6),lx,a1)
c
    do 565 i=664,668
        write(4,566) a(i,1),x1(i),s1(i),a(i,2),x2(i),s2(i),a(i,3),x3(i),
        *s3(i)
566 format(3(lx,f15.3,lx,a6,lx,a1))
565 continue

c
    write(4,595) a(669,1),x1(669),s1(669),a(669,2),x2(669),s2(669),
    *a(669,3),x3(669),s3(669),rhs(2)
595 format(3(lx,f15.3,lx,a6,lx,a1),lx,f10.1)
c
    print *, '... year 3 budget constraints ....'
    call insert(1)

c
    do 600 i=670,739
        read(2,610) x1(i),x2(i),x3(i)
610 format(3(8x,a6,lx))
600 continue
c
    do 620 i=670,739
        write(4,621) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
621 format(3(lx,f15.3,lx,a6,lx))
620 continue
c
    do 630 i=740,809
        read(2,640)s1(i),x1(i),s2(i),x2(i),s3(i),x3(i)
640 format(3(lx,a1,8x,a6))
630 continue
c

```

```

        do 641 i=810,814
            read(2,642) x1(i),x2(i),x3(i)
642     format(3(10x,a6))
641     continue
c
        read(2,643) x1(815),x2(815),x3(815),sign
643     format(3(10x,a6),1x,a1)
c
        do 647 i=740,809
            write(4,648) s1(i),a(i,1),x1(i),s2(i),a(i,2),x2(i),s3(i),a(i,3),
            *x3(i)
648     format(3(1x,a1,1x,f15.3,1x,a6))
647     continue
c
        do 649 i=810,814
            write(4,650) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
650     format(3(1x,f15.3,1x,a6,1x))
649     continue
c
        write(4,651) a(815,1),x1(815),a(815,2),x2(815),a(815,3),x3(815)
        *,sign
651     format(3(1x,f15.3,1x,a6,1x),a1)
c
        do 680 i=816,832
            read(2,690) x1(i),s1(i),x2(i),s2(i),x3(i),s3(i)
690     format(3(8x,a6,1x,a1))
680     continue
c
        do 693 i=816,832
            write(4,694) a(i,1),x1(i),s1(i),a(i,2),x2(i),s2(i),a(i,3),x3(i),
            *s3(i)
694     format(3(1x,f15.3,1x,a6,1x,a1))
693     continue
c
        read(2,695) x1(833),s1(833),x2(833),s2(833),x3(833),s3(833)
695     format(3(8x,a6,1x,a1))
c
        write(4,696) a(833,1),x1(833),s1(833),a(833,2),x2(833),s2(833),
        *a(833,3),x3(833),s3(833),rhs(3)
696     format(3(1x,f15.3,1x,a6,1x,a1),1x,f10.1)
c
        print *, '... year 4 budget constraints ....'
        call insert(1)
c
        do 700 i=834,903
            read(2,705) x1(i),x2(i),x3(i)
705     format(3(8x,a6,1x))
700     continue
c
        do 715 i=834,903
            write(4,716) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
716     format(3(1x,f15.3,1x,a6,1x))
715     continue
c

```

```

do 730 i=904,973
  read(2,740) s1(i),x1(i),s2(i),x2(i),s3(i),x3(i)
740  format(3(1x,a1,8x,a6))
730  continue
c
do 741 i=974,990
  read(2,742) x1(i),x2(i),x3(i)
742  format(3(10x,a6))
741  continue
c
  read(2,743) x1(991),x2(991),x3(991),sign
743  format(3(10x,a6),1x,a1)
c
do 747 i=904,973
  write(4,748) s1(i),a(i,1),x1(i),s2(i),a(i,2),x2(i),s3(i),a(i,3),
*x3(i)
748  format(3(1x,a1,1x,f15.3,1x,a6))
747  continue
c
do 749 i=974,990
  write(4,750) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
750  format(3(1x,f15.3,1x,a6,1x))
749  continue
c
  write(4,751) a(991,1),x1(991),a(991,2),x2(991),a(991,3),x3(991)
*,sign
751  format(3(1x,f15.3,1x,a6,1x),a1)
c
do 780 i=992,1021
  read(2,790) x1(i),s1(i),x2(i),s2(i),x3(i),s3(i)
790  format(3(8x,a6,1x,a1))
780  continue
c
do 793 i=992,1021
  write(4,794) a(i,1),x1(i),s1(i),a(i,2),x2(i),s2(i),a(i,3),x3(i),
*s3(i)
794  format(3(1x,f15.3,1x,a6,1x,a1))
793  continue
c
  read(2,795) x1(1022),s1(1022),x2(1022),s2(1022),x3(1022),s3(1022)
795  format(3(8x,a6,1x,a1))
c
  write(4,796) a(1022,1),x1(1022),s1(1022),a(1022,2),x2(1022),
*s2(1022),a(1022,3),x3(1022),s3(1022),rhs(4)
796  format(3(1x,f15.3,1x,a6,1x,a1),1x,f10.1)
c
  print *, '... year 5 budget constraints ....'
  call insert(1)
c
do 800 i=1023,1092
  read(2,810) x1(i),x2(i),x3(i)
810  format(3(8x,a6,1x))
800  continue
c

```

```

do 820 i=1023,1092

write(4,821) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
821 format(3(1x,f15.3,1x,a6,1x))
820 continue
c
do 830 i=1093,1162
read(2,840)s1(i),x1(i),s2(i),x2(i),s3(i),x3(i)
840 format(3(1x,a1,8x,a6))
830 continue
c
do 841 i=1163,1192
read(2,842) x1(i),x2(i),x3(i)
842 format(3(10x,a6))
841 continue
c
read(2,843) x1(1193),x2(1193),x3(1193),sign
843 format(3(10x,a6)1x,a1)
c
do 847 i=1093,1162
write(4,848) s1(i),a(i,1),x1(i),s2(i),a(i,2),x2(i),s3(i),a(i,3),
*x3(i)
848 format(3(1x,a1,1x,f15.3,1x,a6))
847 continue
c
do 849 i=1163,1192
write(4,850) a(i,1),x1(i),a(i,2),x2(i),a(i,3),x3(i)
850 format(3(1x,f15.3,1x,a6,1x))
849 continue
c
write(4,851) a(1193,1),x1(1193),a(1193,2),x2(1193),a(1193,3),
*x3(1193),sign
851 format(3(1x,f15.3,1x,a6,1x),a1)
c
do 880 i=1194,1240
read(2,890) x1(i),s1(i),x2(i),s2(i),x3(i),s3(i)
890 format(3(8x,a6,1x,a1))
880 continue
c
do 893 i=1194,1240
write(4,894) a(i,1),x1(i),s1(i),a(i,2),x2(i),s2(i),a(i,3),x3(i),
*s3(i)
894 format(3(1x,f15.3,1x,a6,1x,a1))
893 continue
c
read(2,895) x1(1241),s1(1241),x2(1241),s2(1241),x3(1241),s3(1241)
895 format(3(8x,a6,1x,a1))
c
write(4,896) a(1241,1),x1(1241),s1(1241),a(1241,2),x2(1241),
*s2(1241),a(1241,3),x3(1241),s3(1241),rhs(5)
896 format(3(1x,f15.3,1x,a6,1x,a1),1x,f10.1)
c
print *, '... less than one and greater than zero constraints...'
call insert(1)
c
do 180 i=1,1458
read(2,190) c(i)

```

```

190  format(a32)
      write(4,190) c(i)
180  continue
c
      read(2,200) end
      write (4,200) end
200  format(a3)
c
      call insert(1)
      print *, '....setting up file format for LINDO...'
c
      write (4,1001)
1001 format('integer 1359'/'save'/'brough'/'go'/'quit')
c
      close(unit=1)
      close(unit=2)
      close(unit=3)
      close(unit=4)
c
      return
      end
c
c
c
      subroutine totadt(adt,age,tadt,yr)
c
      parameter(nsect=118)
      parameter(factor=10000.)
      parameter(gr=0.04)
      parameter(const=365.)
c
      real adt(nsect),age(nsect),tadt(nsect),nage(nsect)
      integer yr(nsect)
c
      do 90 i=1,nsect
        if(yr(i) .ne. 1982)then
          nage(i)=age(i) + abs(1982-yr(i))
          print *,i,'adjusted age=',nage(i)
        else
          nage(i)=age(i)
        endif
90    continue
c
      do 100 i=1,nsect
        tadt(i)=adt(i)/((1+gr)**nage(i))
        tadt(i)=((tadt(i)*const)/(log(1+gr)))
        tadt(i)=tadt(i)*(((1+gr)**nage(i))-1.)
c
c      .... total adt used was divided by a constant of 10000.
c
      tadt(i)=tadt(i)/factor
c
      print *,i,tadt(i)
c
100  continue
c
      return
      end

```

```

c      subroutine insert(n)
c
      if(n.eq.1)then
        do 10 i=1,5
          print *
10       continue
        elseif(n.eq.2)then
          do 20 i=1,25
            print *
20       continue
          endif
c
        return
      end
c
c      subroutine messg(idle)
c
      character*1 answer
      if(idle.eq.1)then
        print *, '... please wait.....subroutine cswd is in process...'
        call insert(1)
        print *, '(type "c" to continue)'
        read(5,*) answer
        elseif(idle.eq.2)then
          print *, '... please wait.....subroutine objcof is in process...'
          call insert(1)
          print *, '(type "c" to continue)'
          read(5,*) answer
          elseif(idle.eq.3)then
            print *, '... please wait.....subroutine budcof is in process...'
            elseif(idle.eq.4)then
              print *, '... please wait.....subroutine model is in process...'
              call insert(1)
              print *, '(type "c" to continue)'
              read(5,*) answer
              elseif(idle.eq.5)then
                print *, '...please wait for the menu ..... '
              endif
c
            return
          end

```


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